Draft II

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The Use of an Interactive Video Computer in the Classroom

Part 1. McIDAS Case Study Videotapes

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Videocassette needs improvement

TABLE OF CONTENTS

WORKING COPY

TABLE OF CONTENTS

1. Introduction

Within a Synoptic Laboratory course it is often difficult to gather, display and interrelate satellite and radar data with conventional meteorological analyses used in case study exercises. This paper describes a set of case study videotapes and maps which combine high quality satellite imagery with conventional surface and upper air information in describing an interesting case of cyclogenesis and severe weather. Using Man-computer Interactive Computer System (McIDAS) at Space Science and Engineering Center, videotapes of meterological analyses with GOES satellite data have been prepared to complement student investigation of this case. In addition, McIDAS computer products such as GRIDED fields of derived parameters, isentropic cross sections and surfaces were incorporated into the case study. The cyclone studied is a case of dramatic cyclogenesis and strong squall line development over the Midwest during 12-13 May 1978. The purpose of this paper is to describe and document the videotape presentations on this case, detail the role of McIDAS in additional support of the study and assess the impact of the videotape and computer products in the classroom.

2. McIDAS Videotapes

Three videotapes were prepared to support the case study investigation.

Introductory Tape. The first tape was an introduction consisting of hourly GOES visual and infrared imagery sequences of a crucial 16 hours of the cyclogenesis period. The tape was shown on the distribution day of the case study map set with the purpose of illustrating to the students weather events which their analyzed maps would describe. The cloud and weather patterns evolve in dramatic fashion on 12-13 May as shown on Figure 1. At 1200 GMT (Figure 1A) the weather activity with the incipient low consisted of a modest area of showers and thundershowers over the Northern Plains while an active frontal system was moving through the eastern states. During the day the convective activity expanded rapidly under the influence of an amplifying upper level trough and associated strong upper level jet streak. By 2200 GMT GOES visual data (Figure 1B) shows a developing comma cloud area associated with the developing cyclone in Iowa. An intense rain shield with embedded convection is present north of the low while strong thunderstorms are developing along the cold front to the south. The satellite data at the end of the image loop (Figure 1C), 0400 GMT 13 May, shows the cyclone nearing maturity with a classic comma pattern.

Case Study Analyses. The following map set was prepared for student analyses of this case:

Surface Maps:

1200 GMT 12 May

1800 GMT 12 May

0000 GMT 13 May

0600 GMT 13 May

1200 GMT 13 May

Upper Air Maps:

850, 700, 500, 300 mb and 300 K, 310 K, 320 K surfaces and cross-sections for

1200 GMT 12 May

0000 GMT 13 May

1200 GMT 13 May

Radar Maps:

1435-2335 GMT 12 May

Appendix A includes analyzed and master copies of these charts.

Two longer videotapes were prepared for the class discussion of the case after map analyses were completed. The goal of the videotapes was to combine satellite and radar views of rapid cyclogenesis and squall line development with standard surface and upper air analyses.

Using McIDAS, a variety of conventional analyses were mapped into the satellite projection so that the student can directly interrelate weather features with the basic meteorological fields which he (she) is analyzing in the course. One tape focuses primarily on features associated with cyclogenesis while the second studies the squall line and severe weather development associated with the cyclone.

An outline of each videotape follows with key aspects of each scene noted.

<u>Videotape 1</u>

Title: Satellite and Conventional Analysis of Midwest Cyclogenesis of May 12-13, 1978.

Objective: To interrelate satellite images and loops with upper and lower tropospheric observations of cyclogenesis using McIDAS.

I. Satellite Sequence

A. GOES 16 hour IR loop of Midwest

II. Surface and Satellite Analyses

B. Surface Temperature Analyses

C. Surface Streamlines

D. Surface Temperature Banding

E. Surface Weather

III. Upper Tropospheric Feature with Satellite Imagery

A. 500 mb Geopotential Height

B. 500 mb Temperature and Height

C. 500 mb Vorticity with Streamlines

D. 500 mb Isotachs with Streamlines

E. 300 mb Isotachs with Streamlines

LLJ (850 ?)

IV. Combination of Surface and Upper Air Features with Satellite Images

A. Surface and 500 mb Streamlines

B. Surface Streamline and 300 mb Isotachs

C. Surface Pressure and 500 mb Heights

sfc press & 300 mb isotachs ?

Videotape 3

Title: Squall Line Development

Objective: Interrelate upper and lower tropospheric observations with satellite images and radar data in the study of squall line development.

I. Satellite and Radar Sequences

A. GOES infrared 6 hour loop

B. Severe Weather Reports on May 12-13, 1978

C. Manually Digitized Radar Data with Satellite Images

II. Upper Tropospheric Features at 12 CMT 12 May

   A. 850 mb Dewpoint

   B. 700 mb Dewpoint

   C. 500 mb Temperature

   D. 500 mb Absolute Vorticity

   E. Totals Index

   F. Selected Soundings

III. Evolution of Surface Features During the Day

   A. Surface Streamline

   B. Surface Divergence

   C. Surface Temperature

   D. Surface Dewpoints

   E. Surface Equivalent Potential Temperature (θ_e)

   F. Divergence θ_e

IV. Upper Tropospheric Features at 0000 GMT 13 May

   A. 850 mb Dewpoint

   B. 700 mb Dewpoint

   C. 500 mb Temperature

   D. 500 mb Vorticity

   E. Totals Index

   F. Selected Soundings

Videotapes were presented and evaluated during the week of the case study discussion. The evaluation form and a compilation of the results are presented in Appendix B.

3. Other McIDAS Case Study Support

a. Dewind Fields

McIDAS has computed a variety of derived fields of dysonically important quantities to complement and extend the investigation of this case. Fields prepared and used were:

850 mb divergence

300 mb divergence

500 mb vorticity advection

850 mb temperature advection

700 mb temperature advection

The derived field grids in plotted form are presented in Appendix C. Appendix D describes the derived fields and illustrates how various features which emerge from the charts complement the traditional synoptic charts in Appendix A.

b. Student Projects

In addition to the basic case study, students also completed an individual project. A number of students selected projects on this case study and used McIDAS capabilities to study:

i) additional derived surface or upper air fields

ii) additional cross-sections

iii) detailed sounding and stability analyses

v) other McIDAS synoptic topics

Appendix E includes a listing of all student projects, the rolw of McIDAS support and an assessment of their value for the course.

Figure List

1201 12MY78 14E-1ZA 01431 13451 KB35N95W-1

Fig 1A

2201 12MY78 24A-1 01181 13401 FQ37A95W 1

Appendix A

Basic Case Study Maps

I. Master Copies

A. Surface maps

1. 1200 GMT 12 May
2. 1800 GMT
3. 0000 GMT 13 May
4. 0600 GMT
5. 1200 GMT

B. Isobaric Charts

300 mb, 500 mb, 700 mb. 850 mb

1. 1200 GMT 11 May
2. 0000 GMT 12 May
3. 1200 GMT 12 May
4. 0000 GMT 13 May
5. 1200 GMT 13 May
6. 0000 GMT 14 May
7. 1200 GMT 14 May

C. Isentronic Charts

1. 0000 GMT 11 May

   300-305 K

2. 1200 GMT 11 May

   300-305 K

3. 0000 GMT 12 May

300-305 K

4. 1200 GMT 12 May - 12 GMT 13 May

290-325 K

D. Radar Charts

14 GMT - 12 May 1970 thru

0235 GMT - 13 May 1970

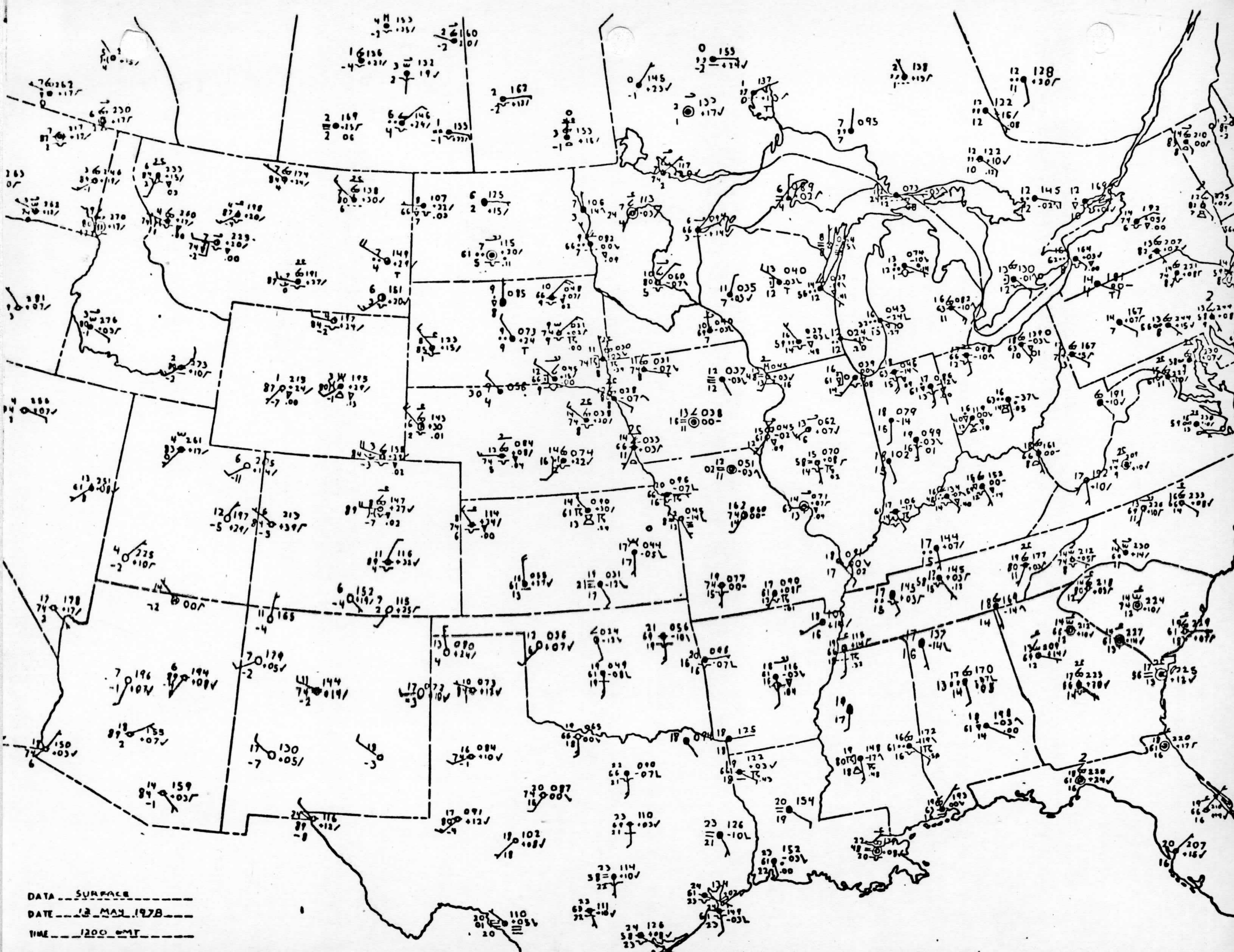
II. Analyzed Maps (12 Z 12 May → 12 Z 13 May)

A. Surface

B. Isobaric

C. Isentropic

A. SURFACE MAPS



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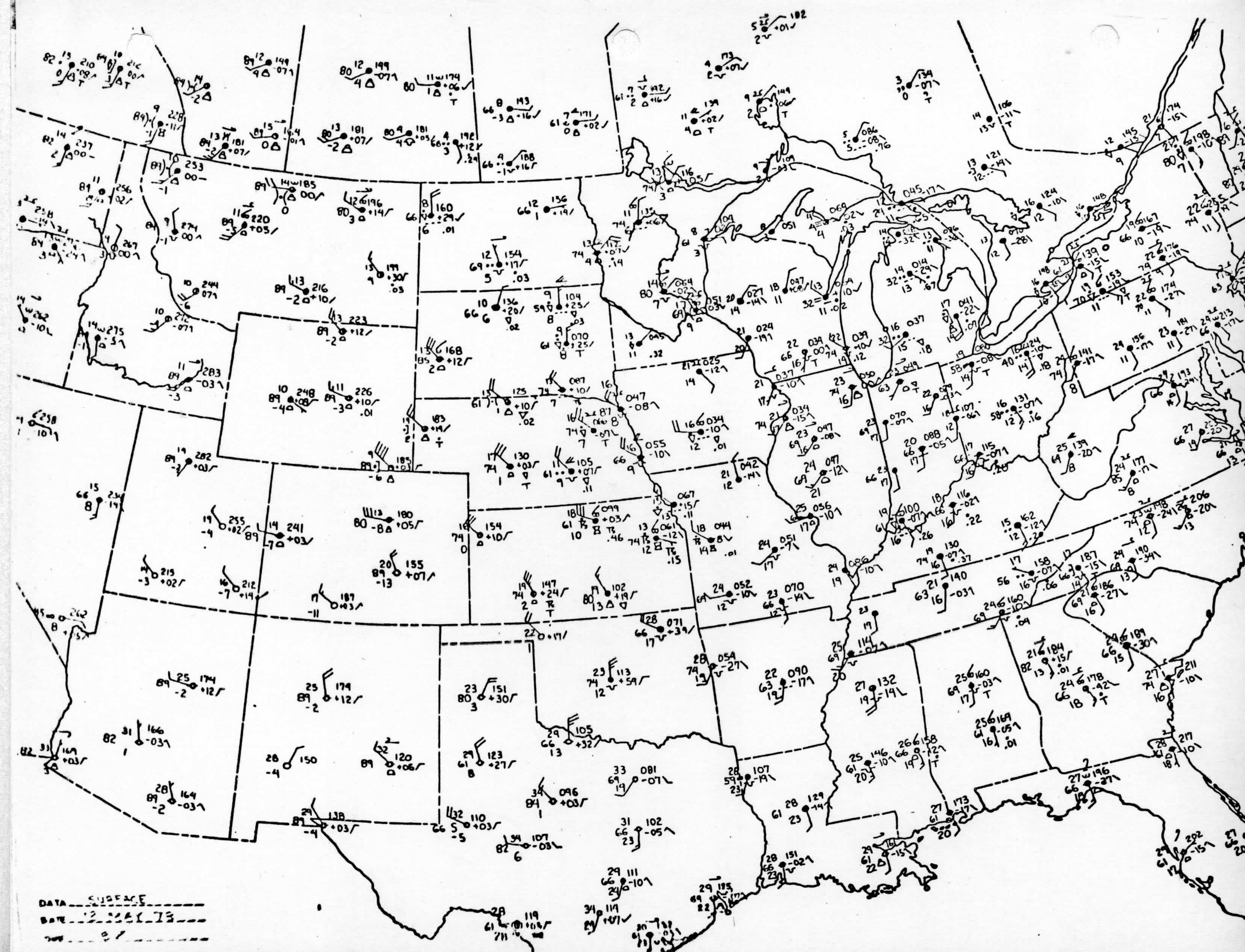

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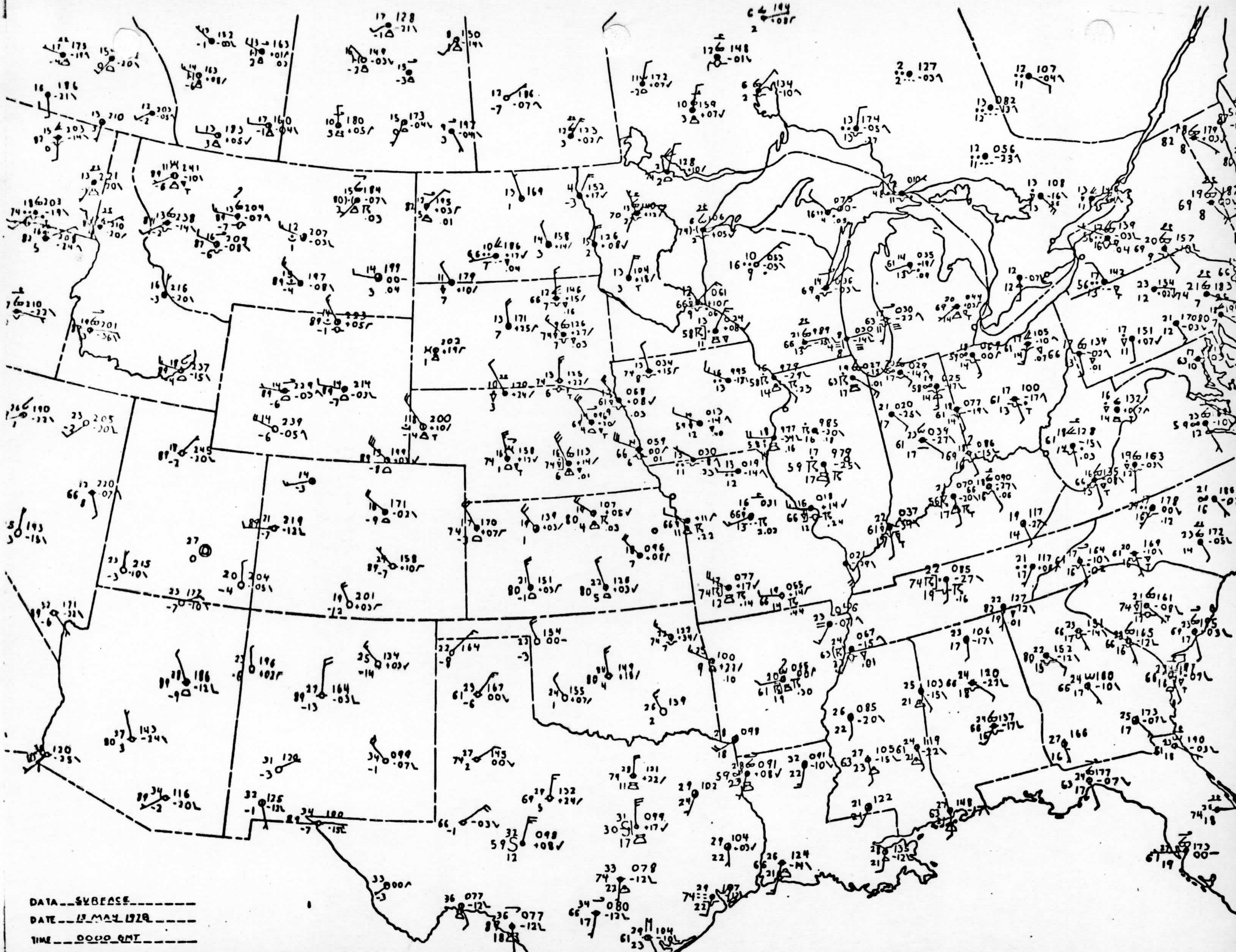

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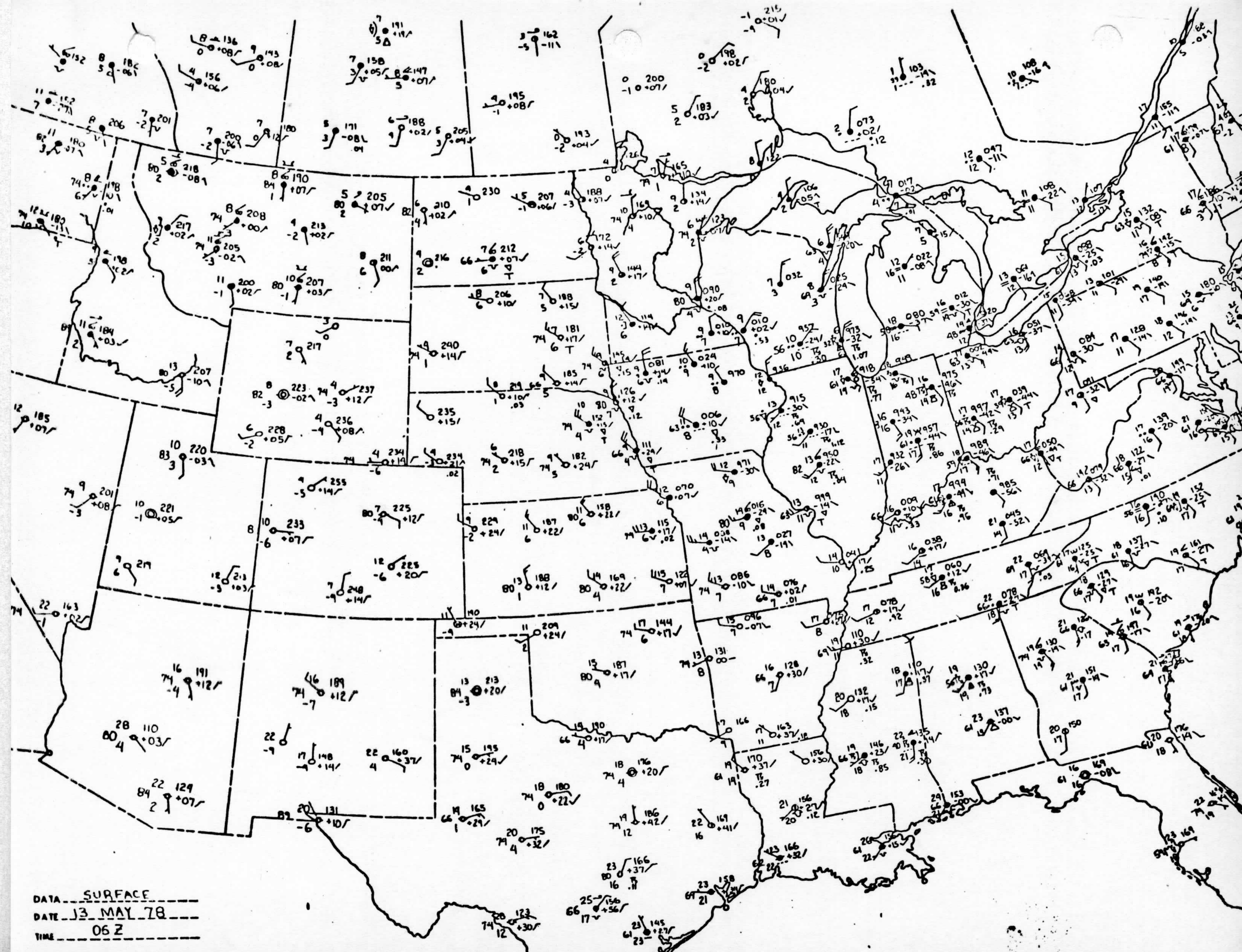

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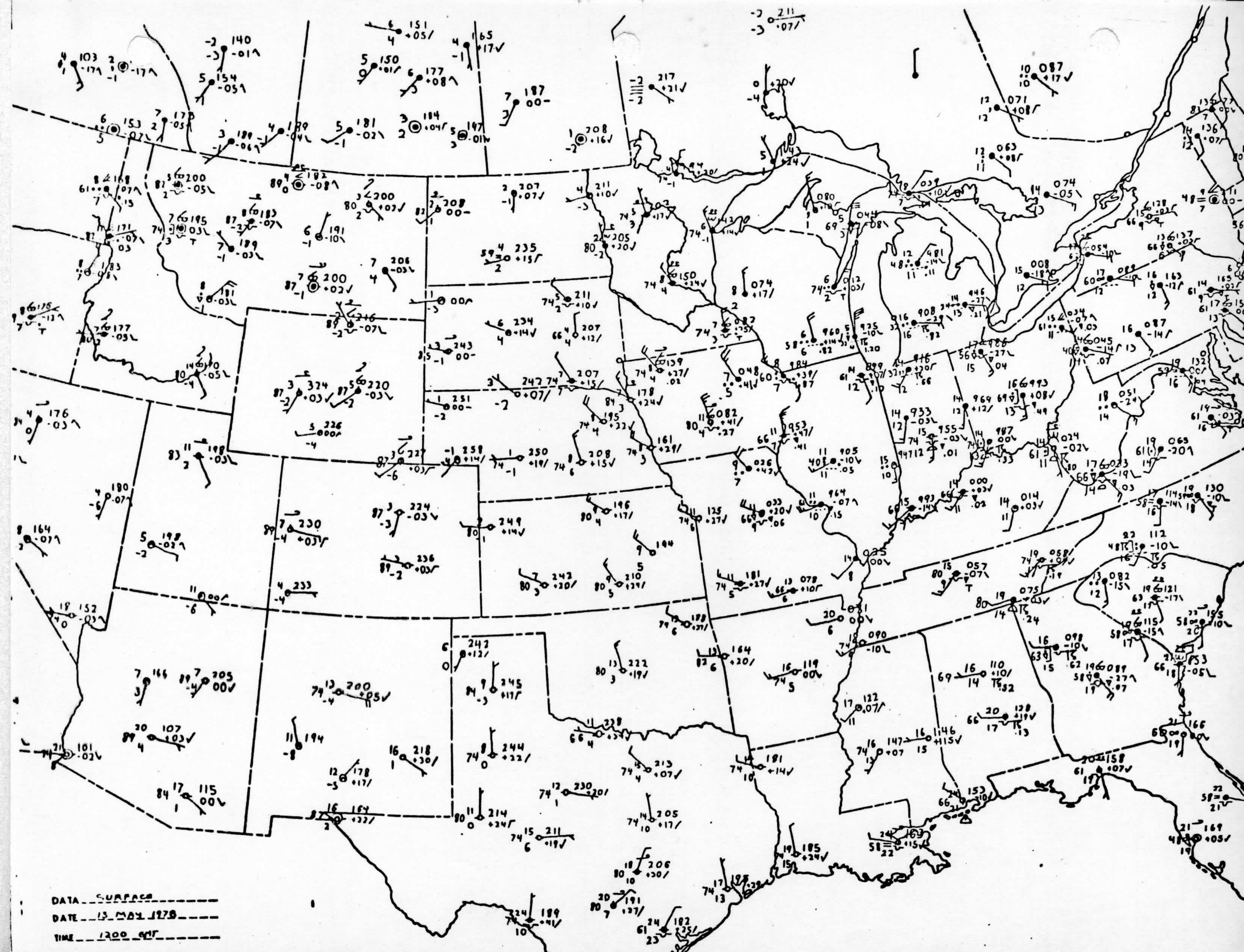

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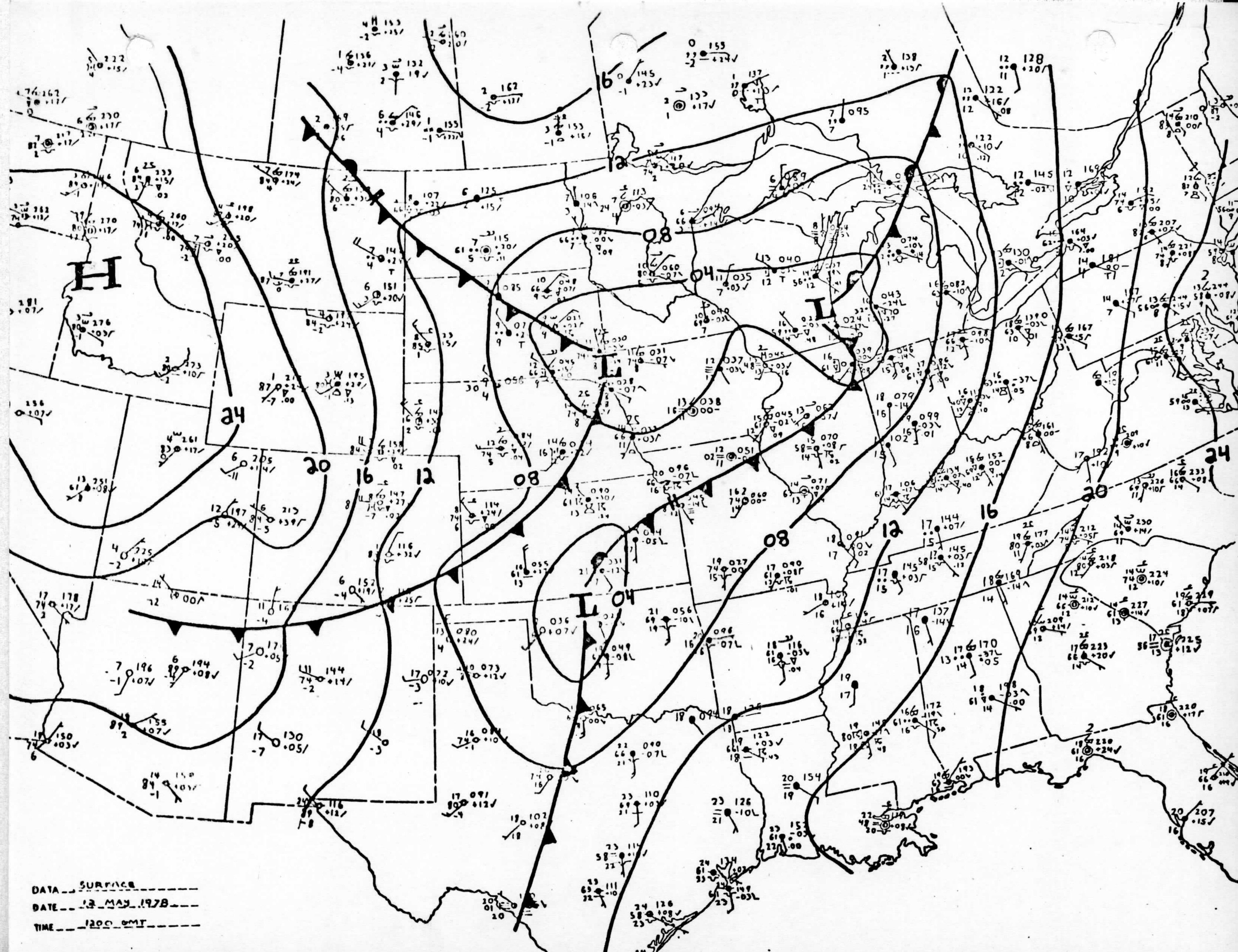

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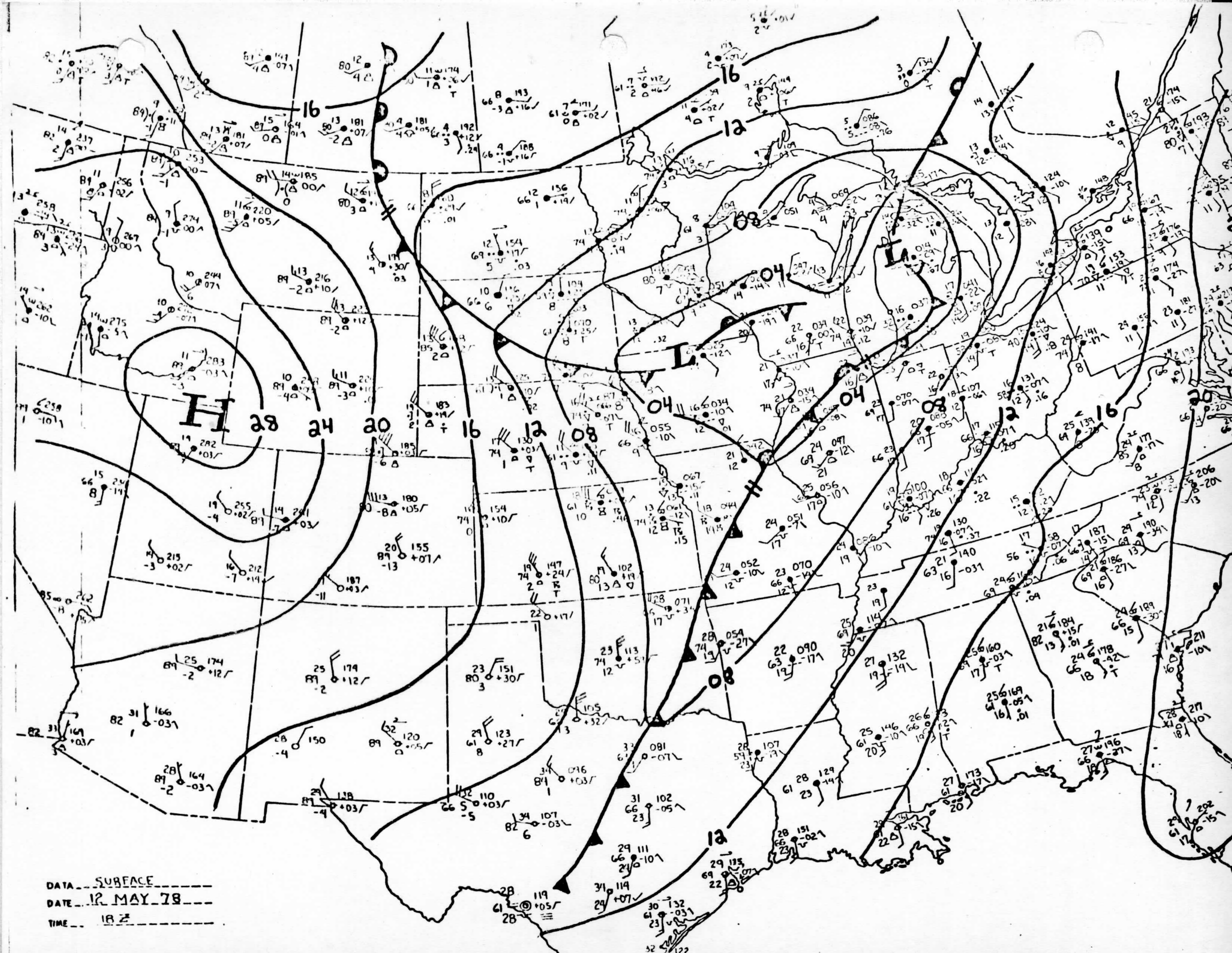
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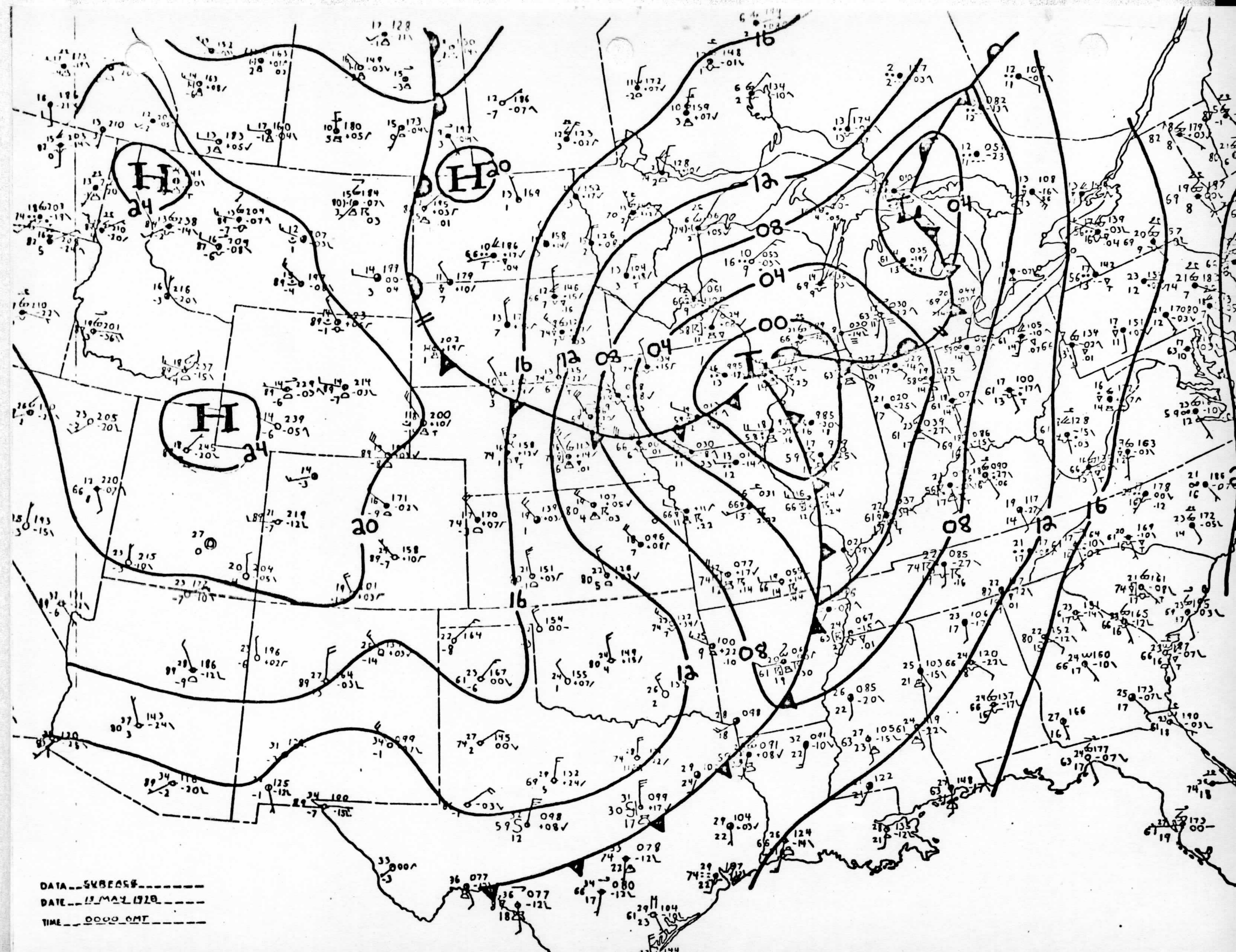

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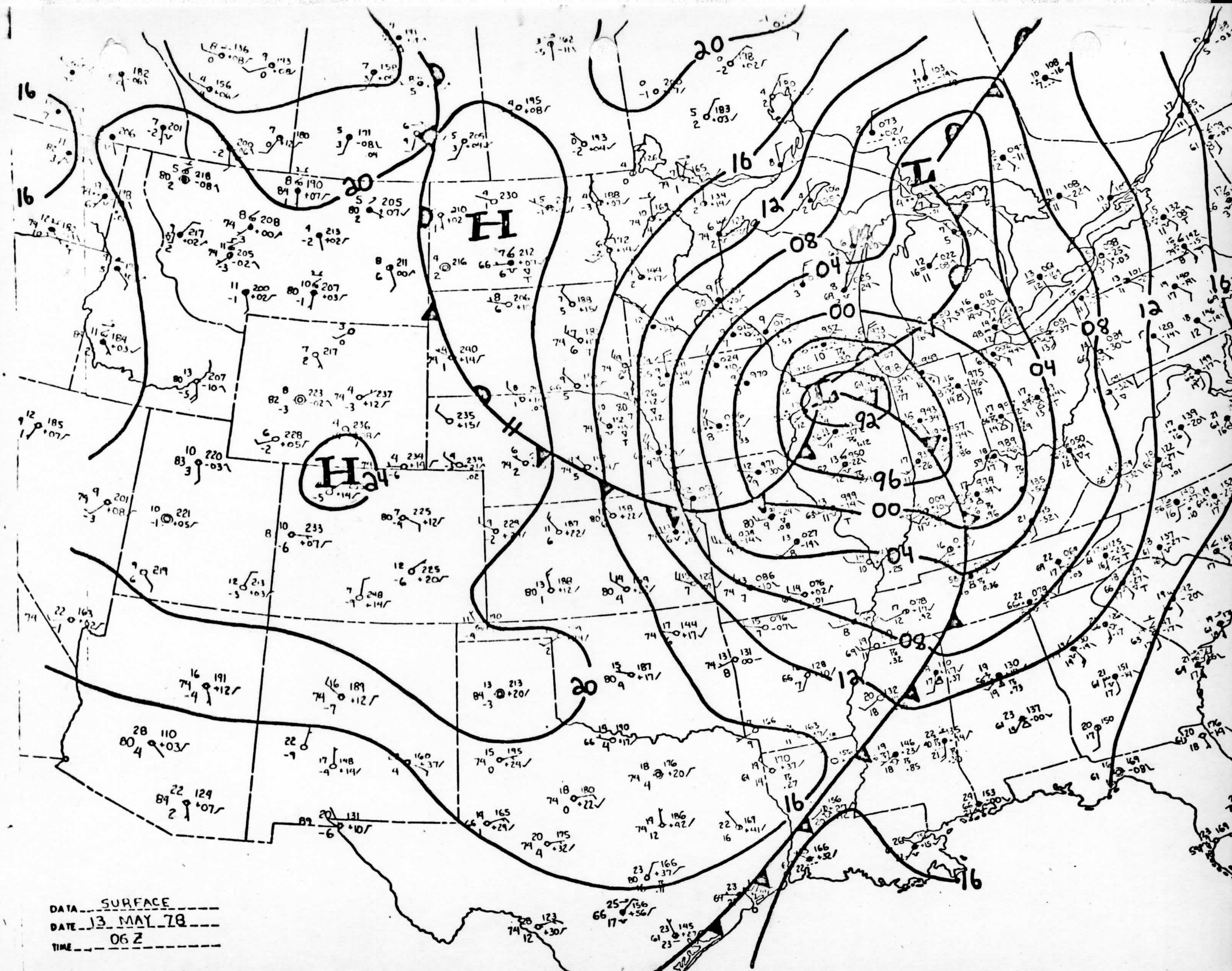

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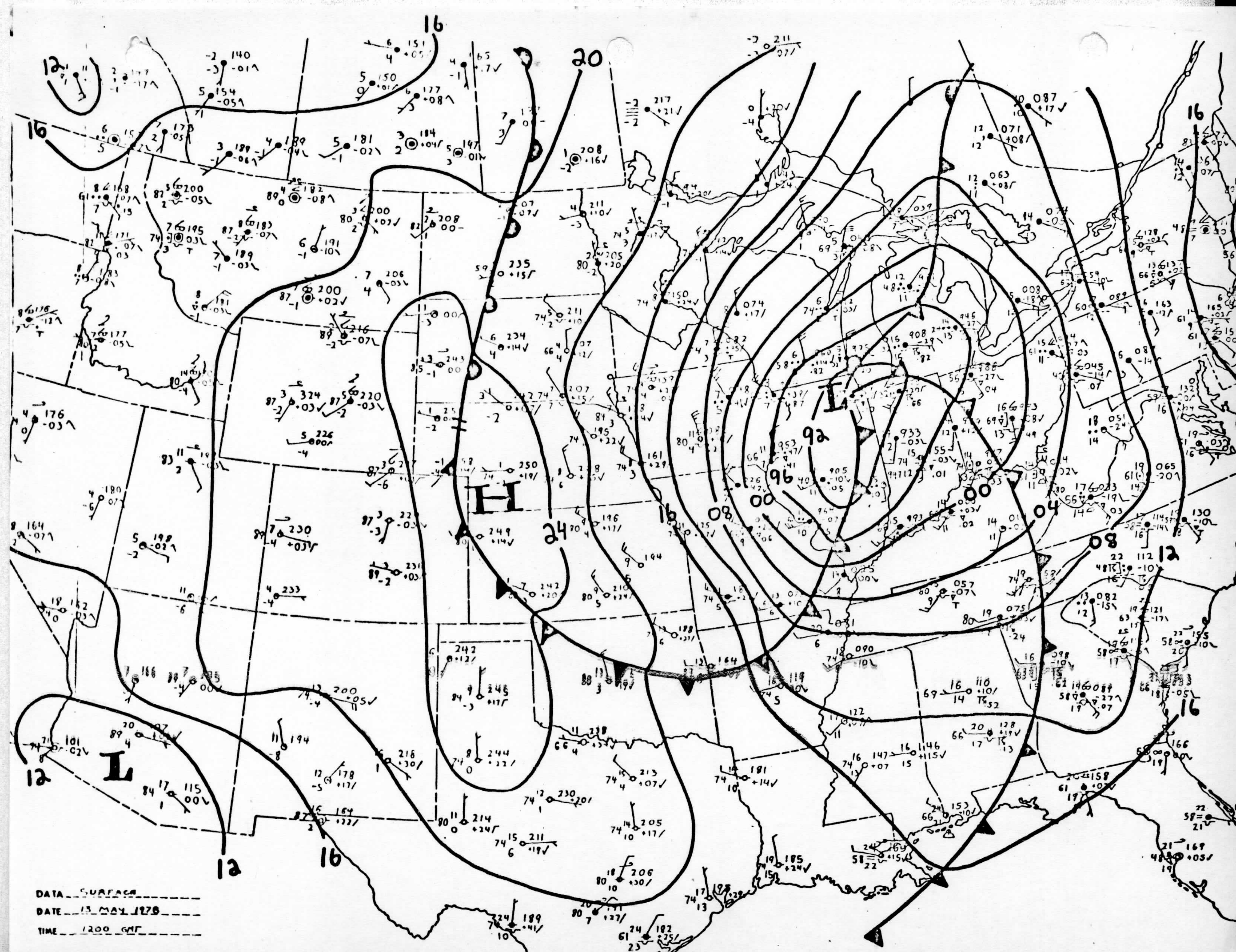
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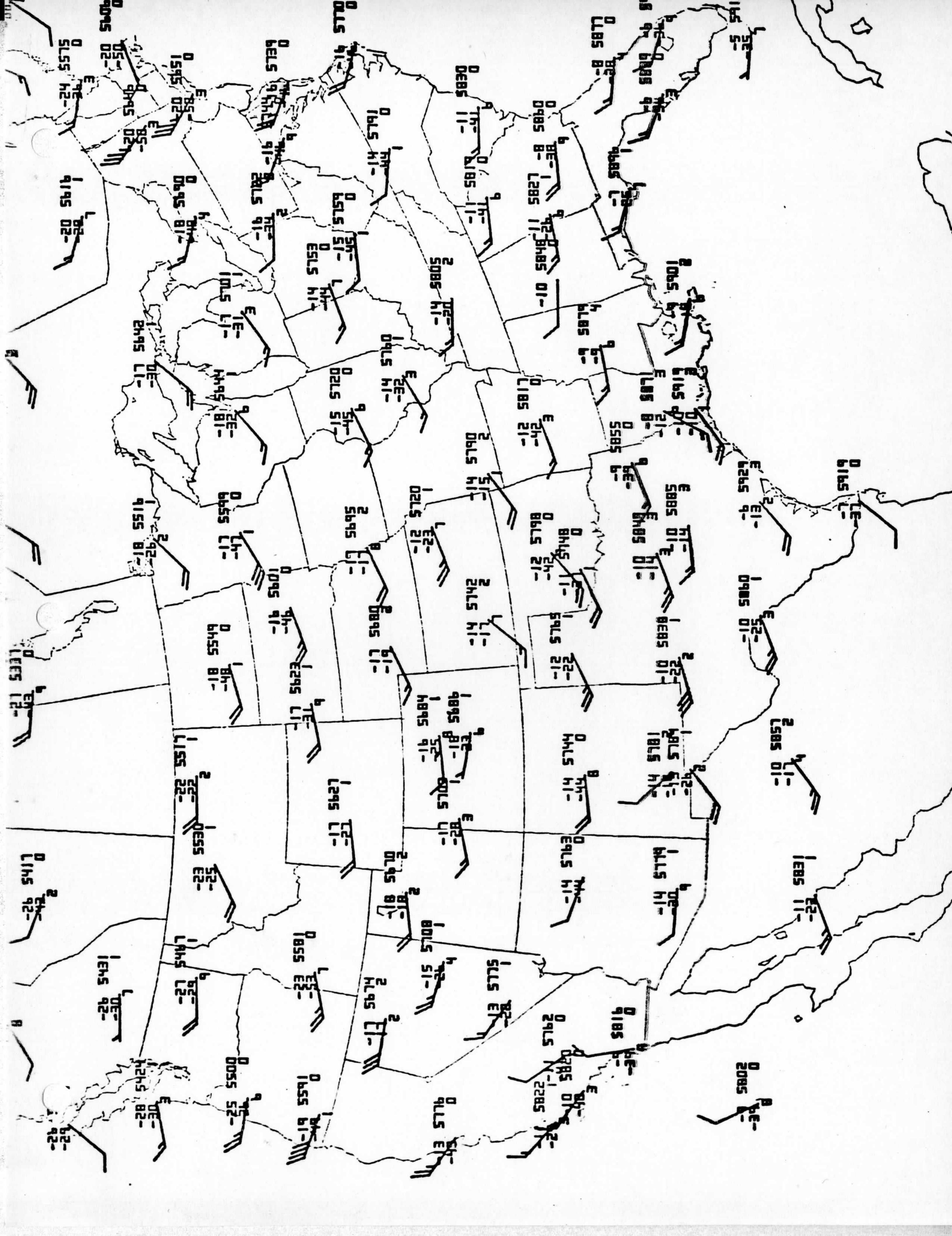

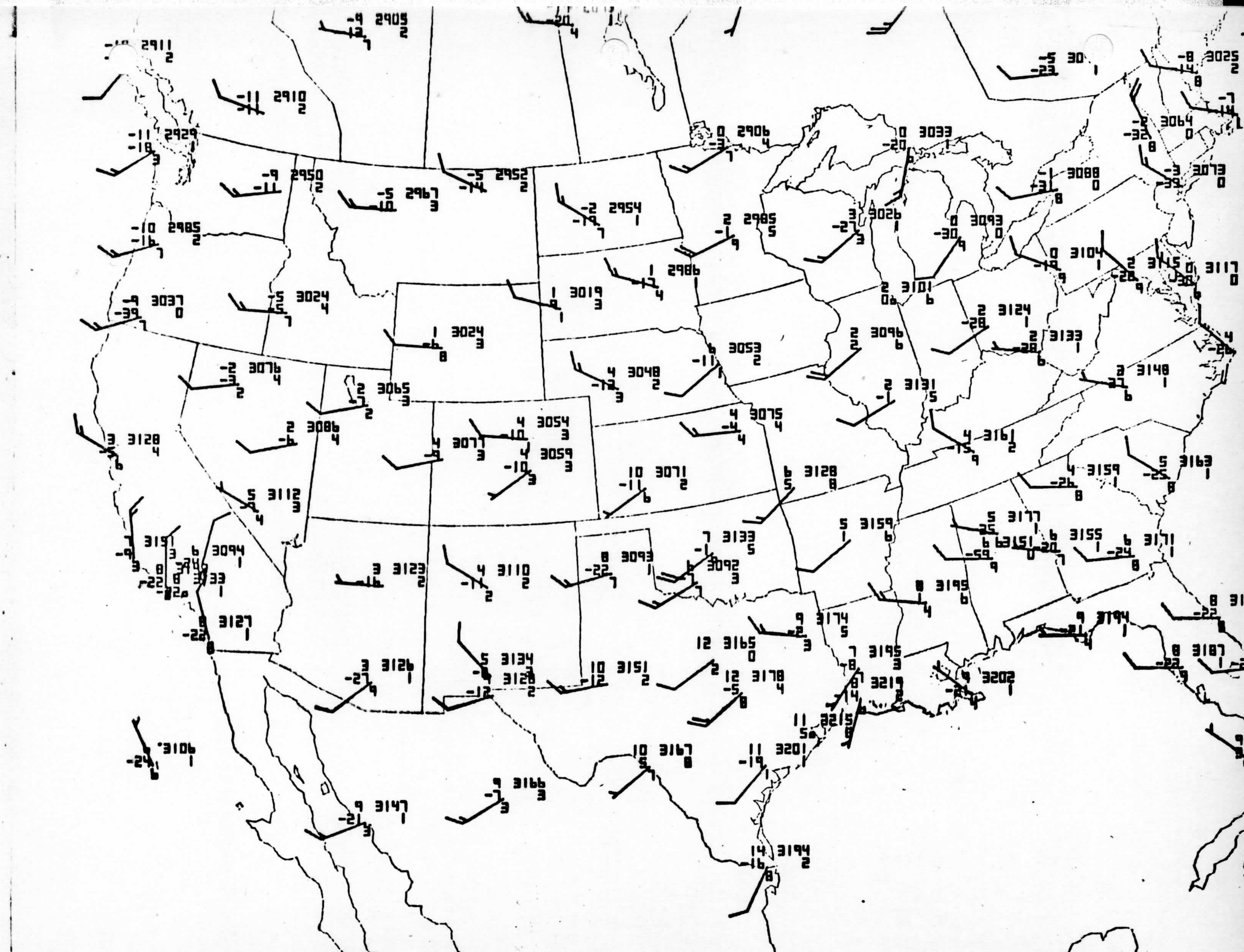

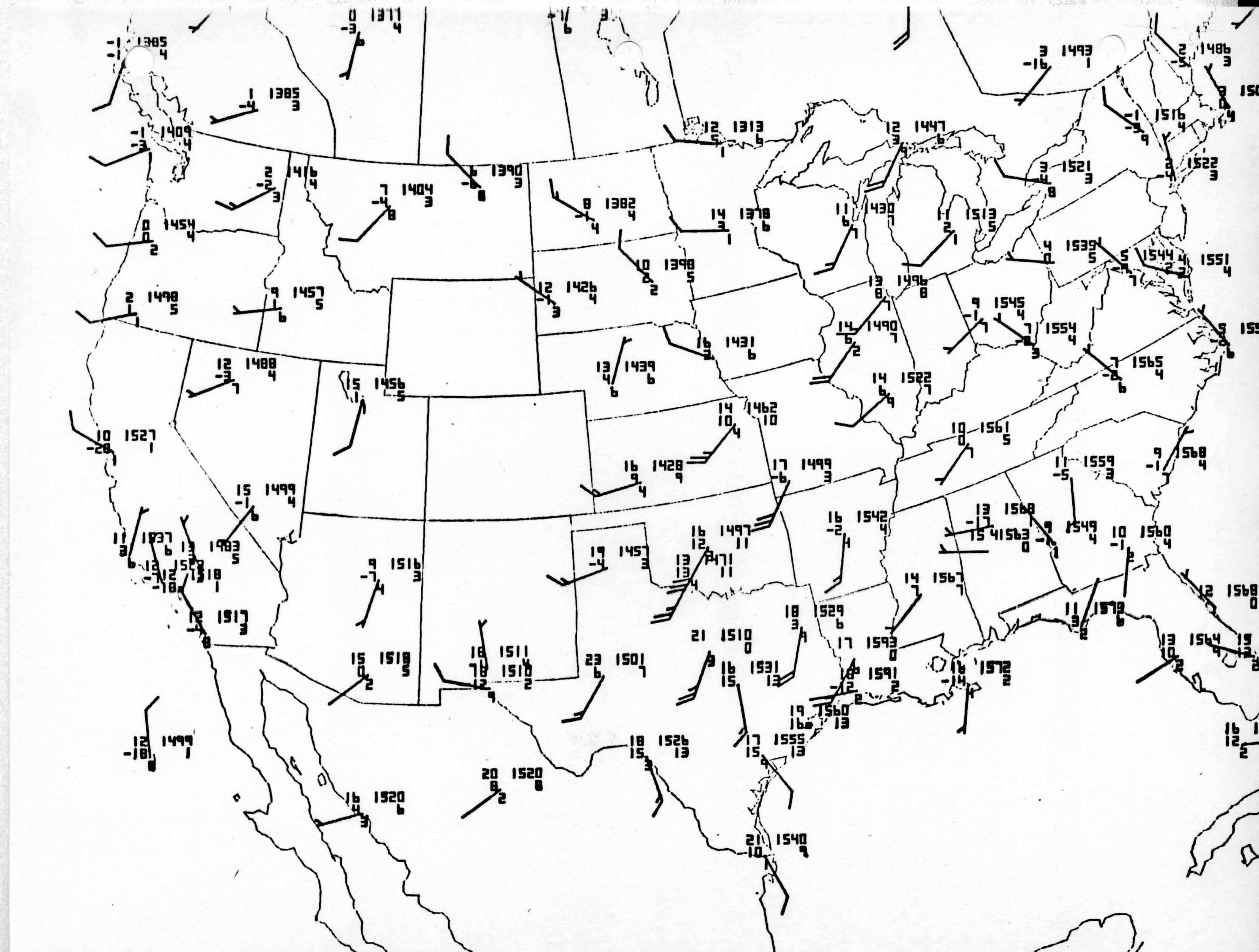

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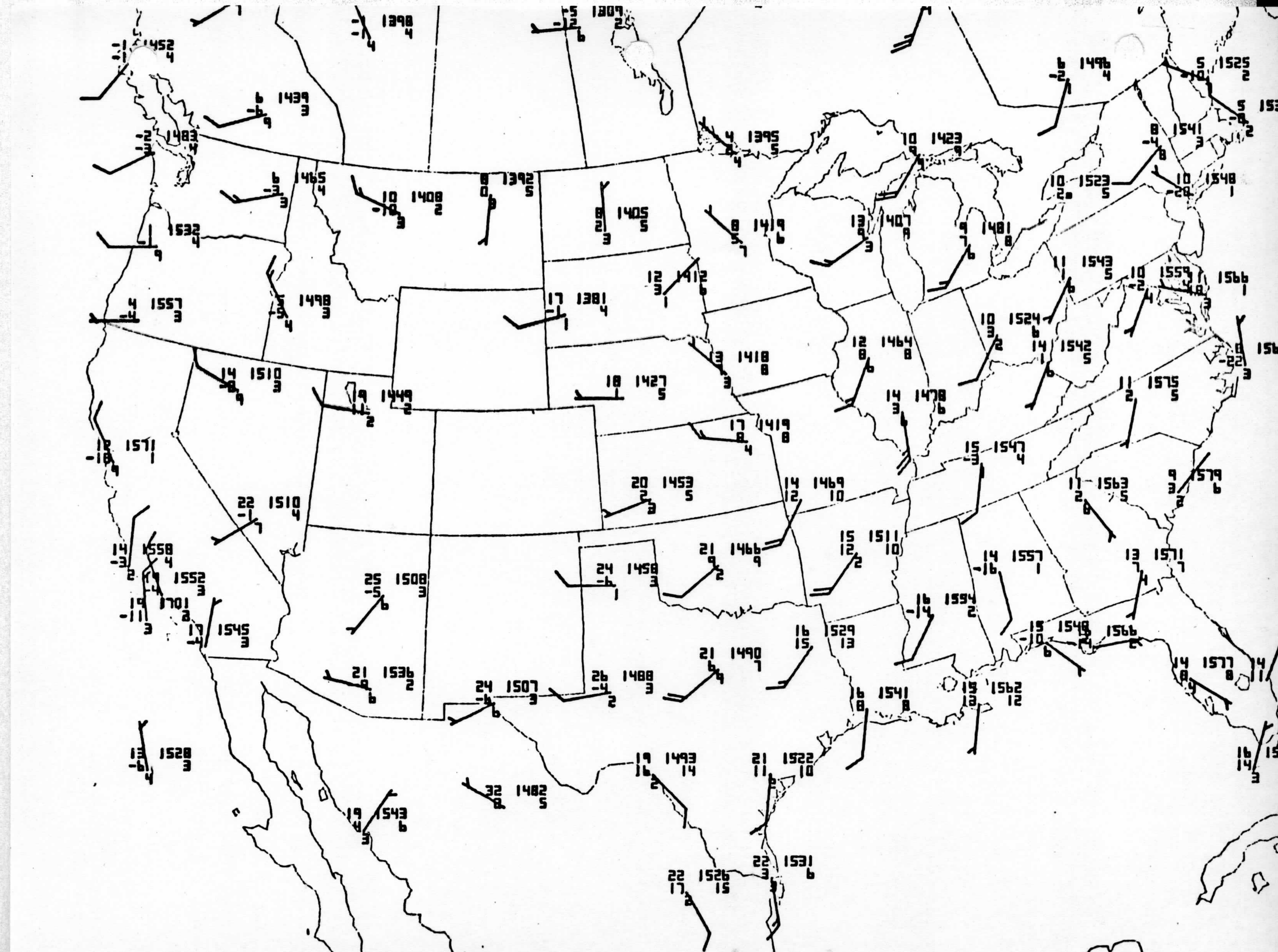

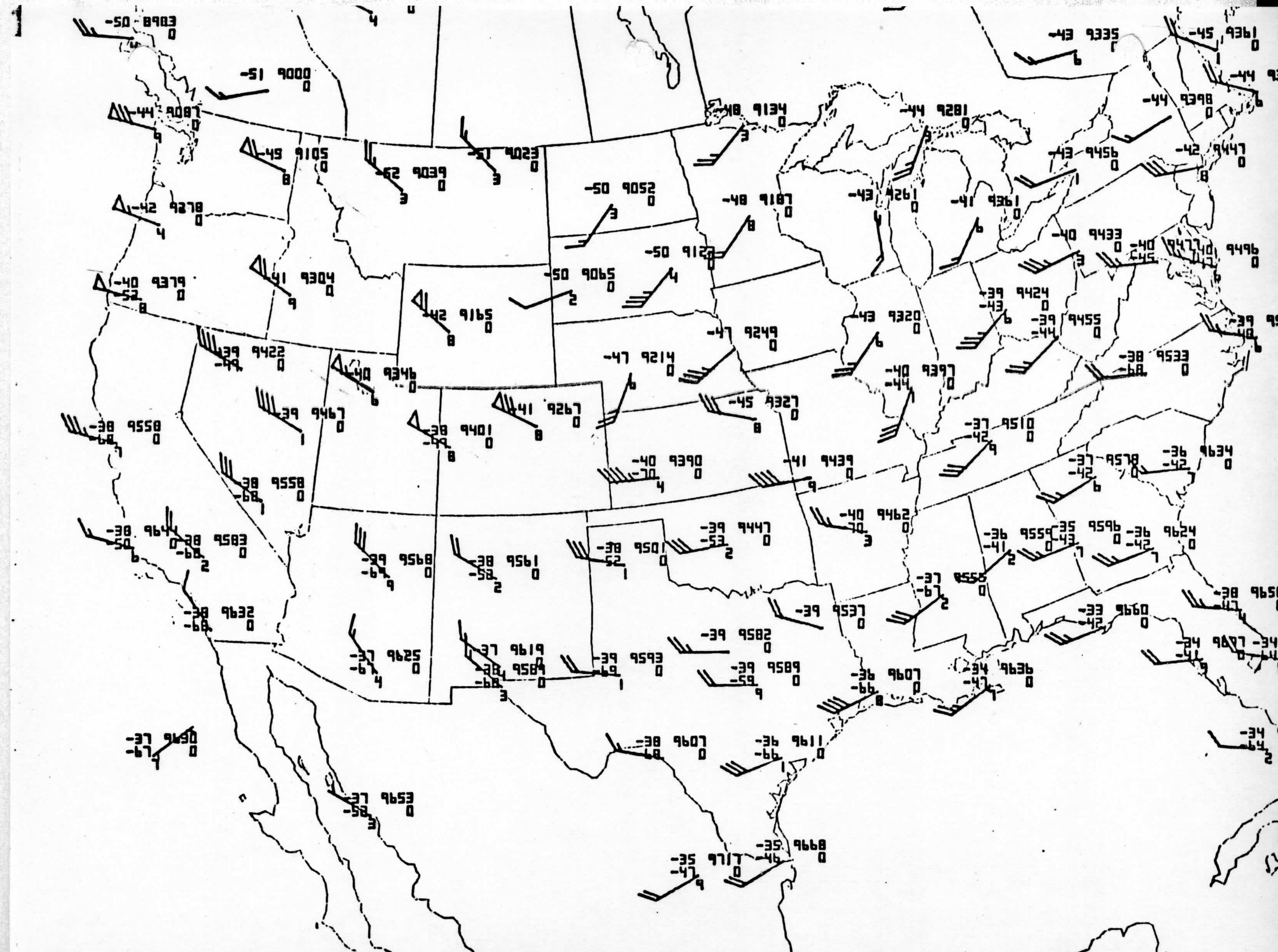

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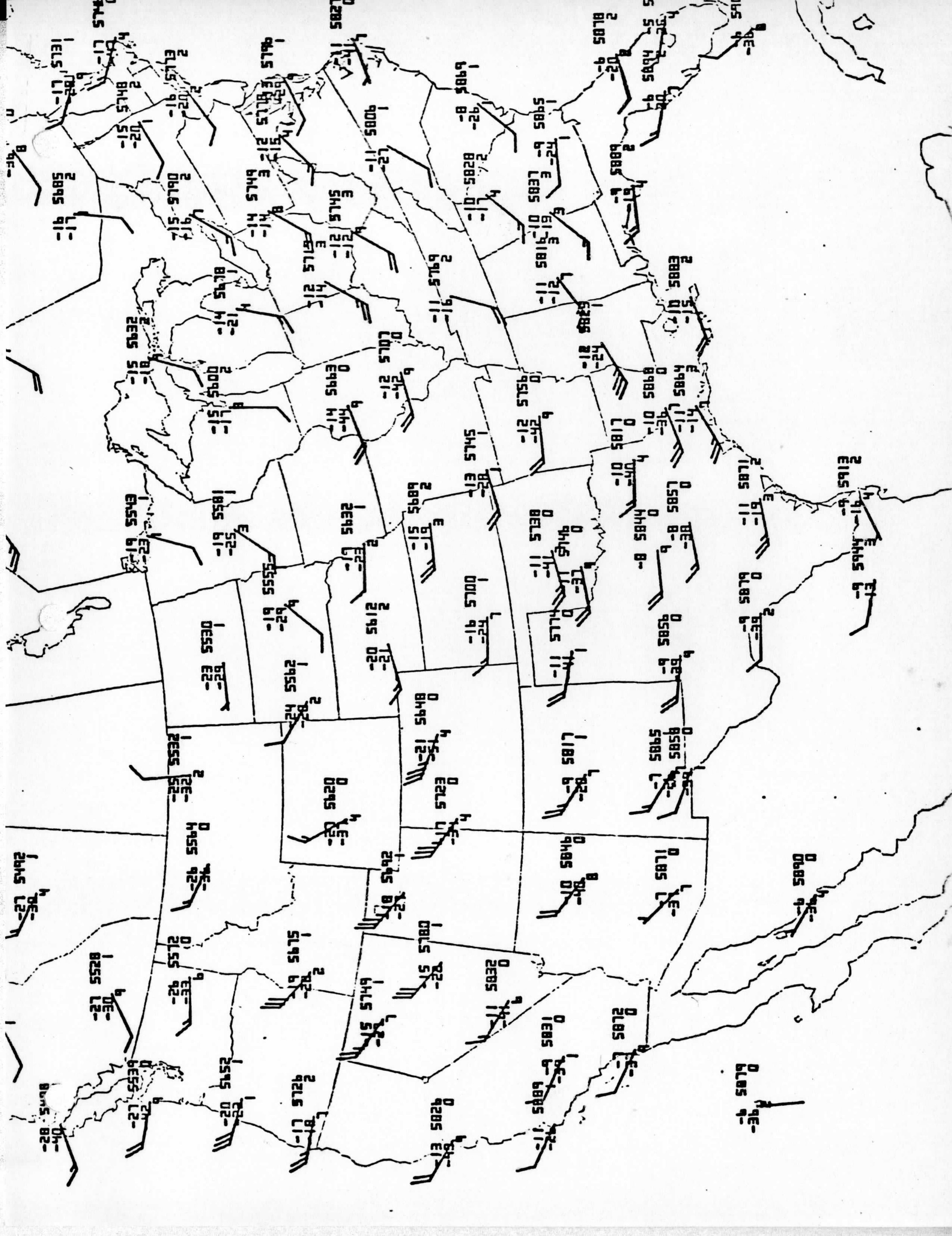

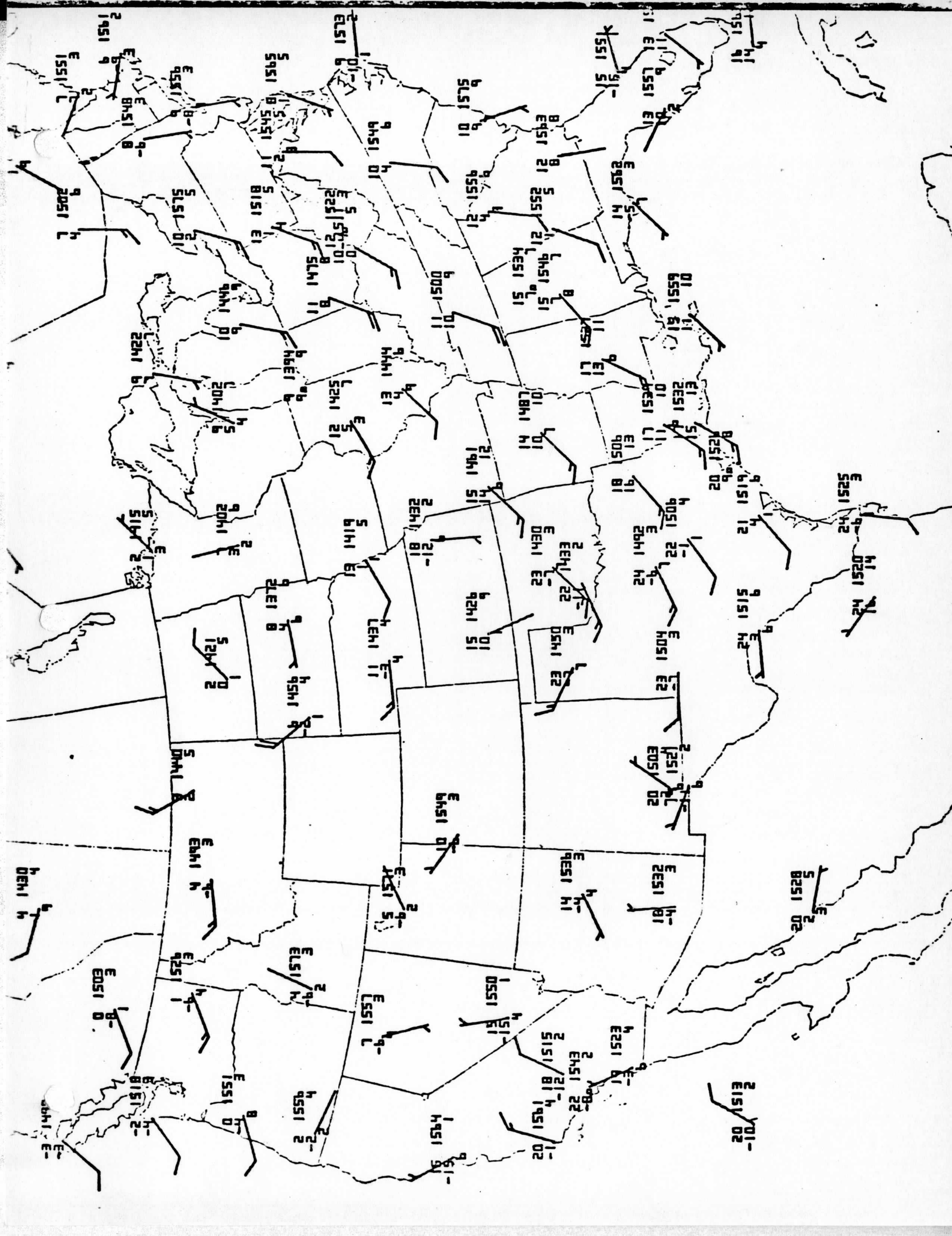

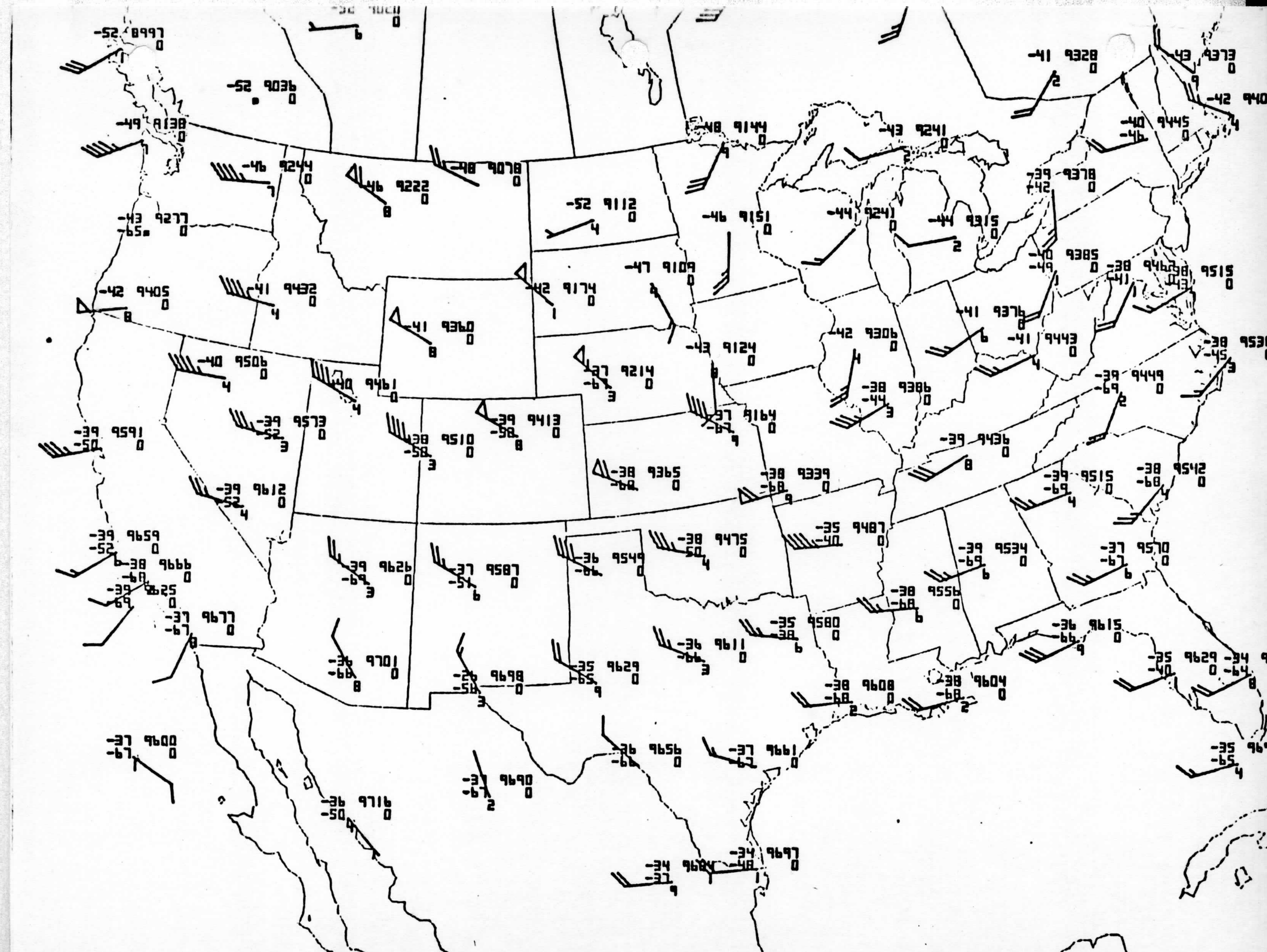

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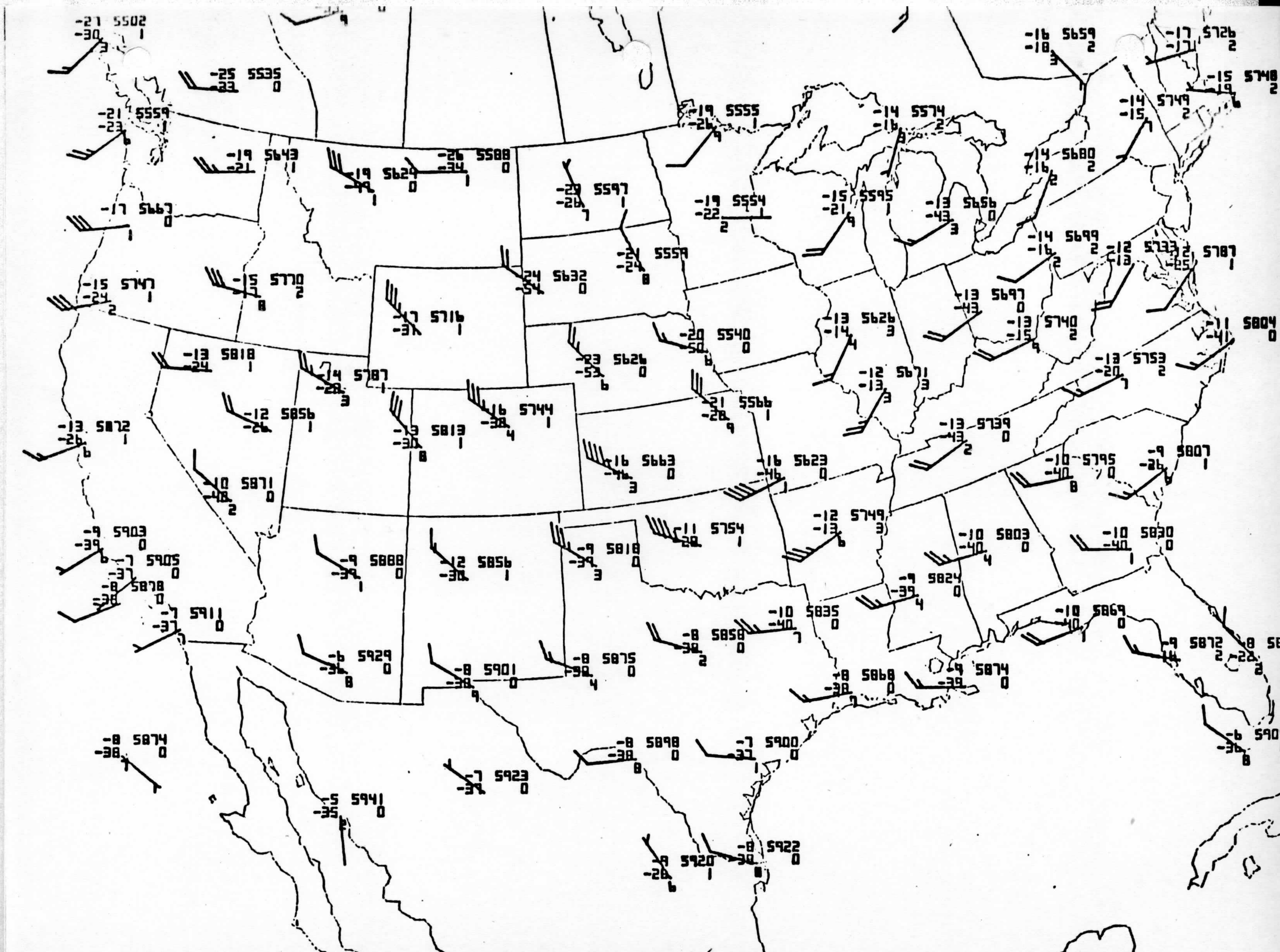

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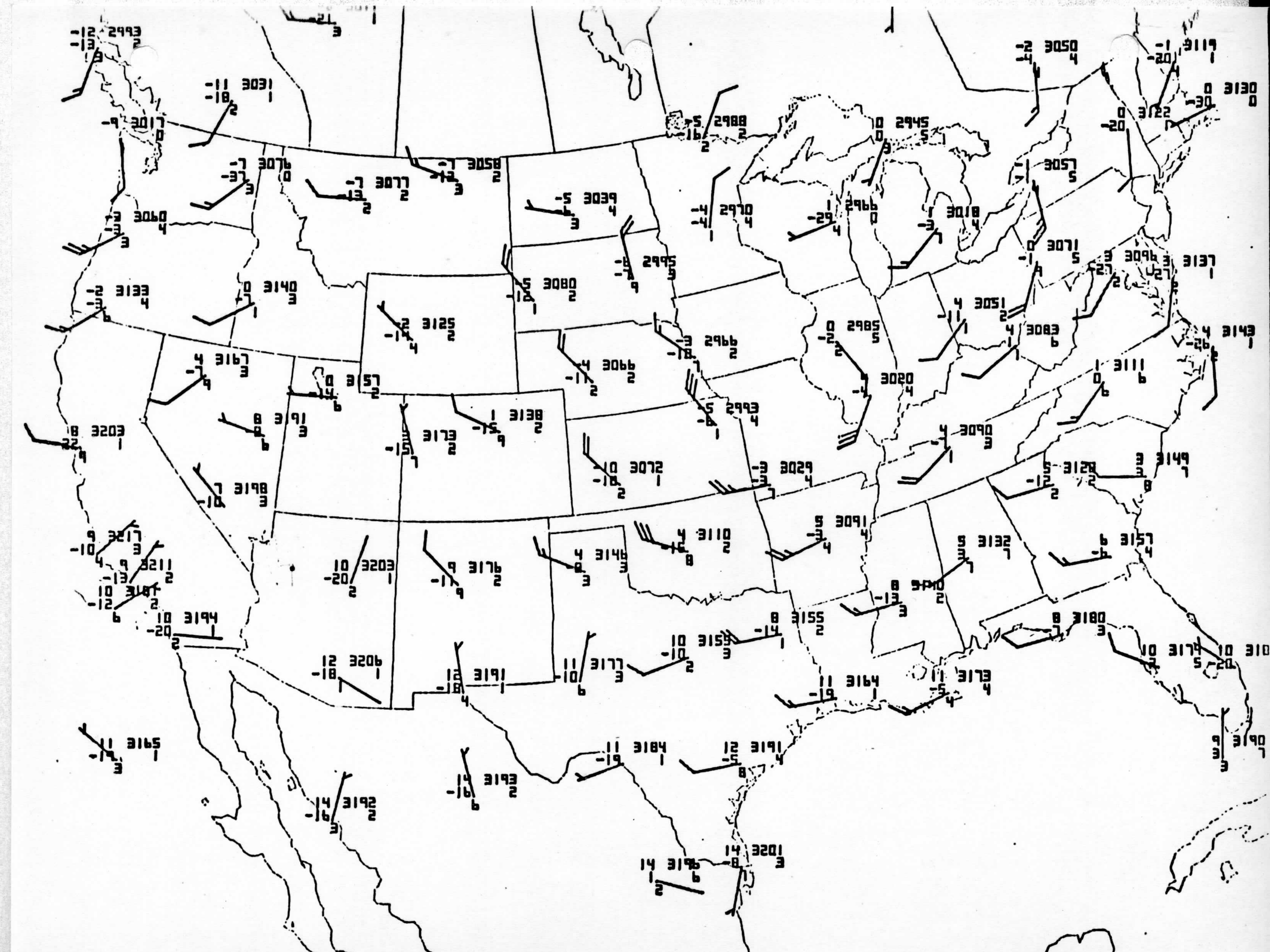

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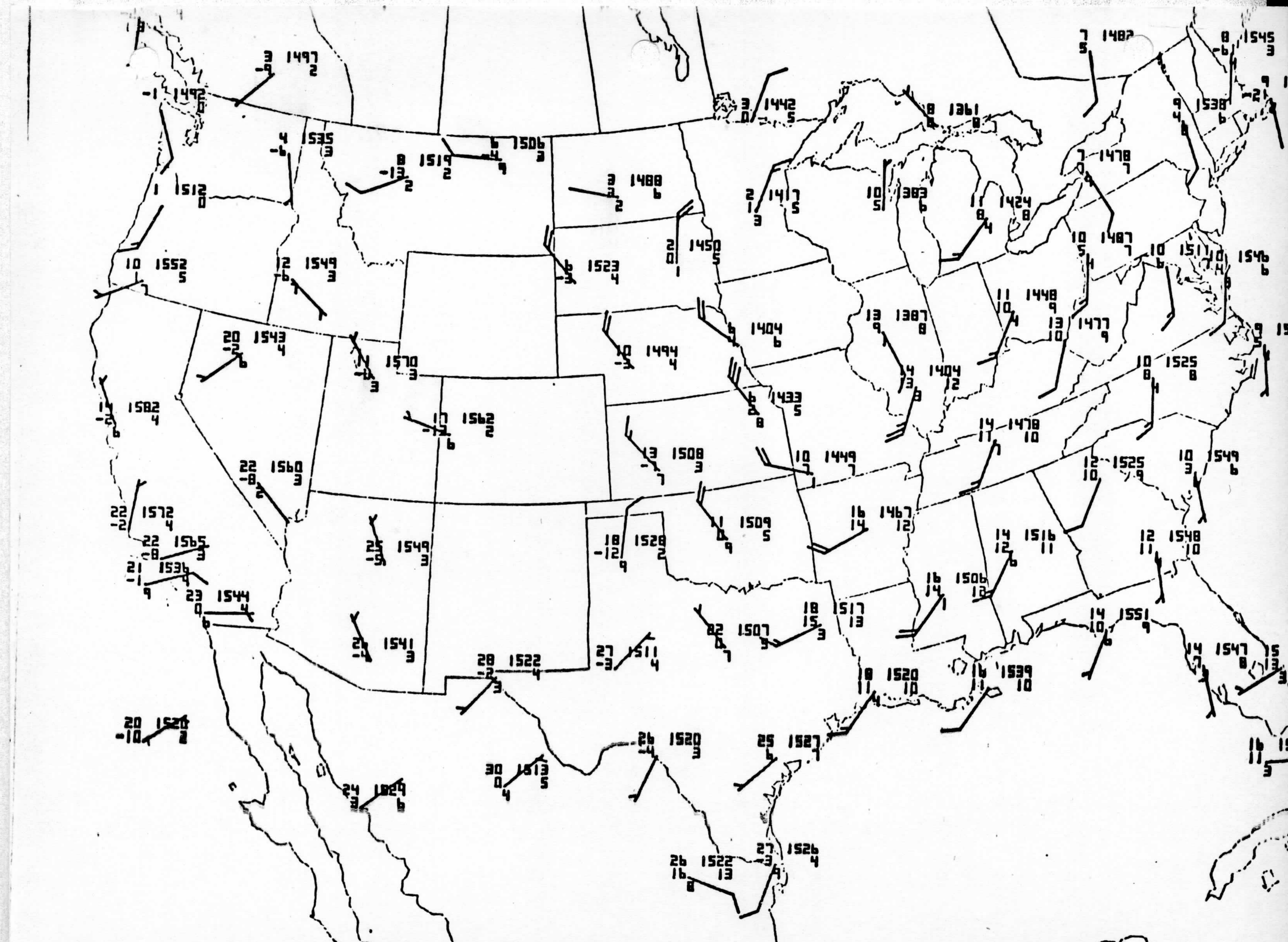

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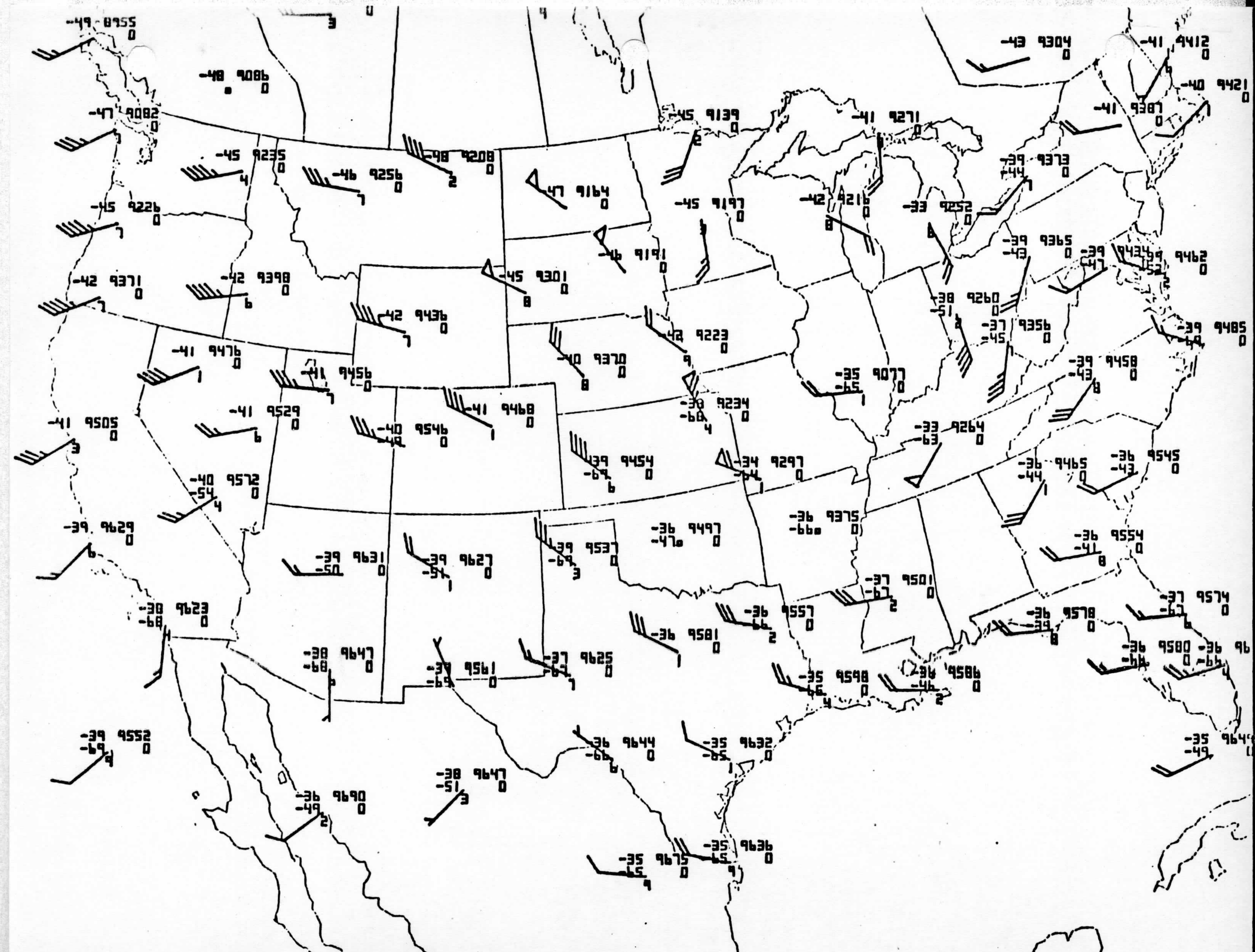

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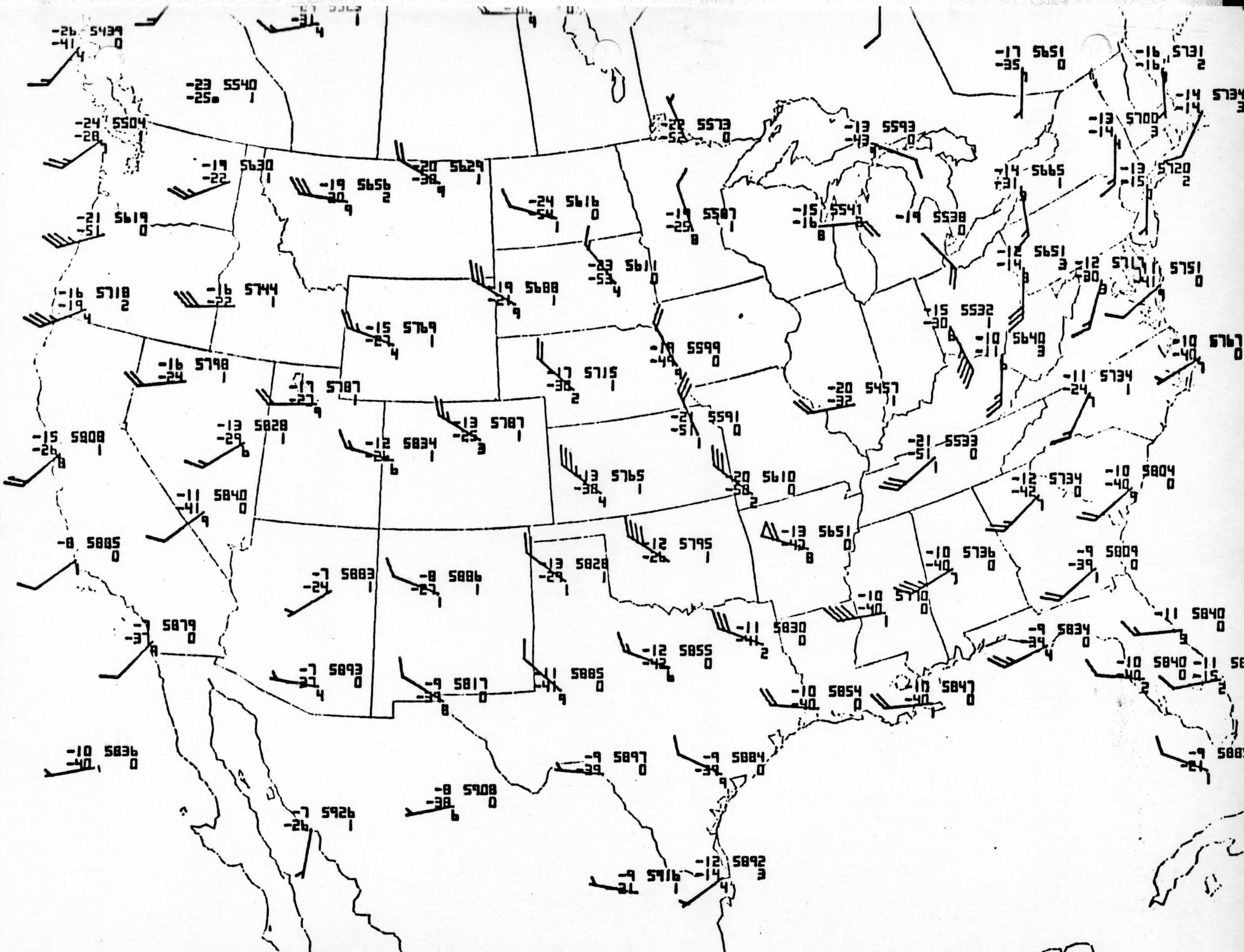

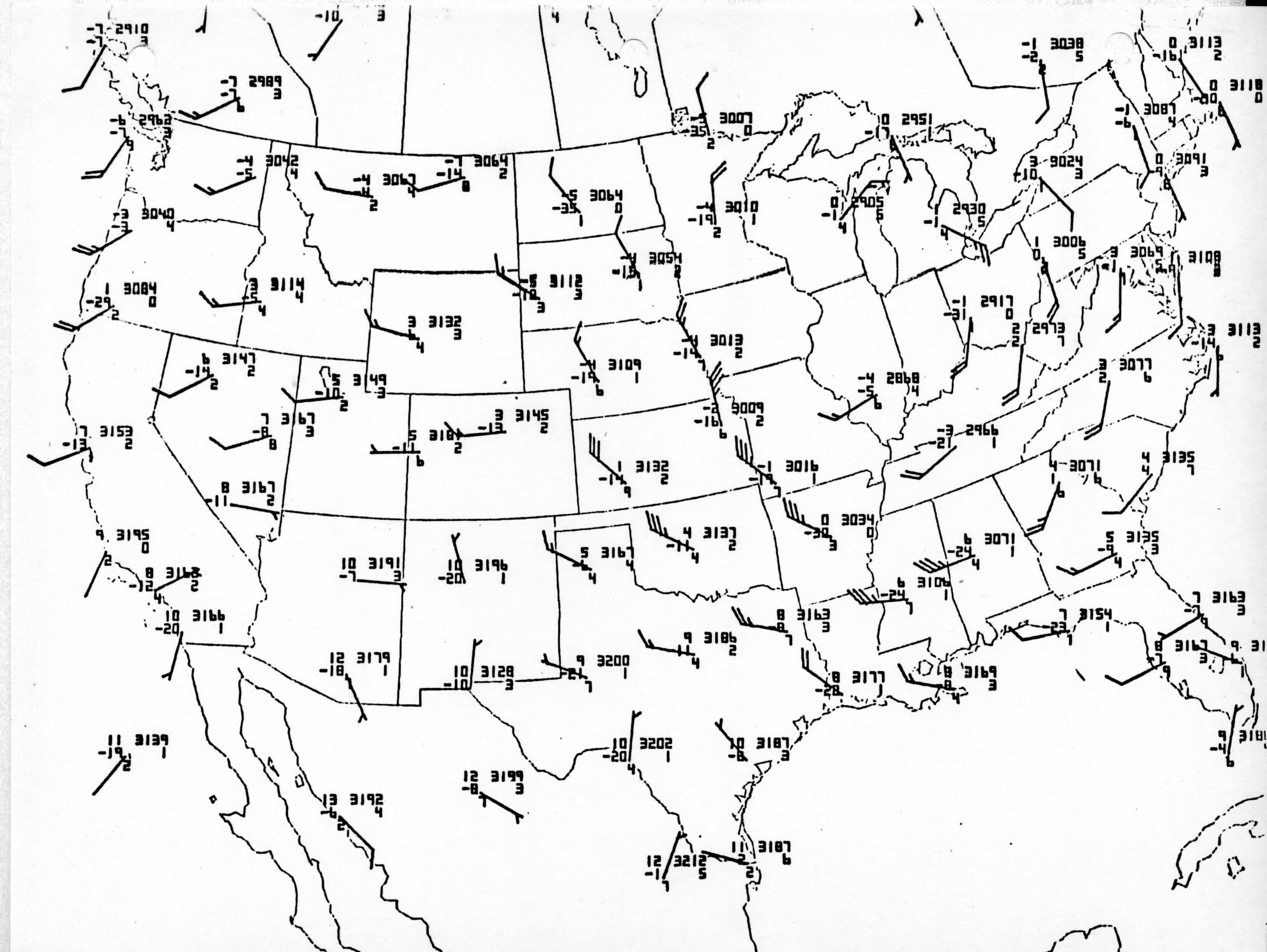

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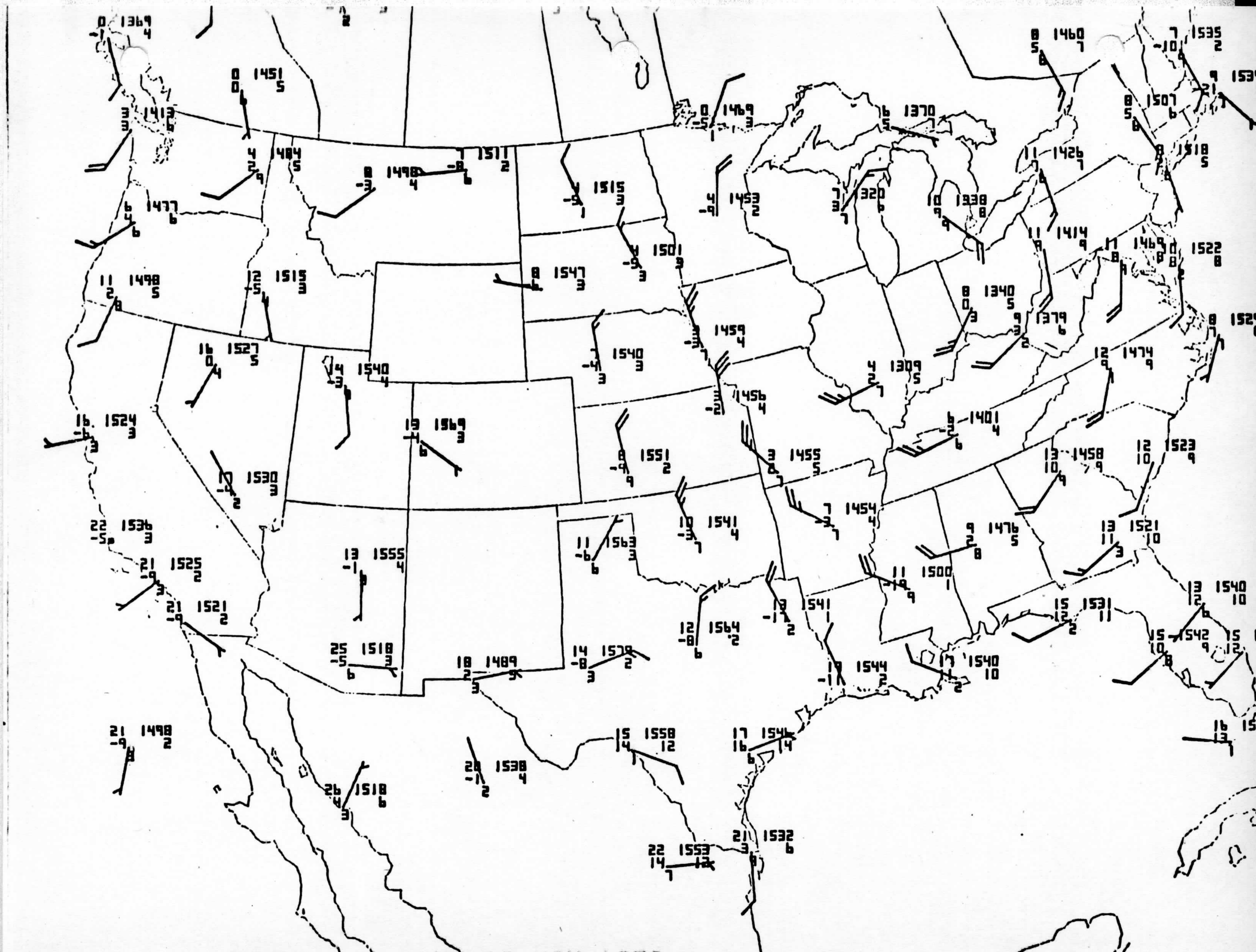

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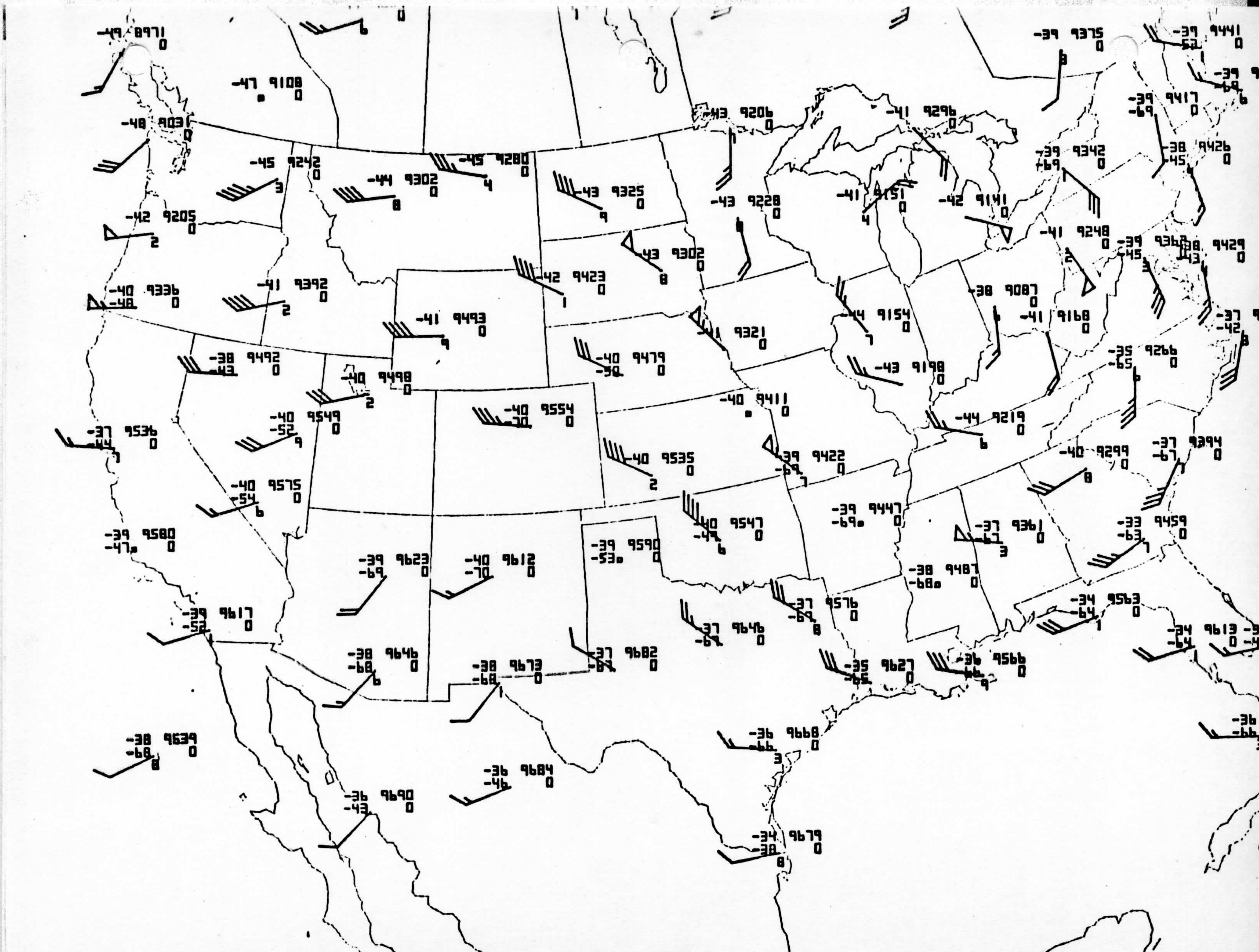

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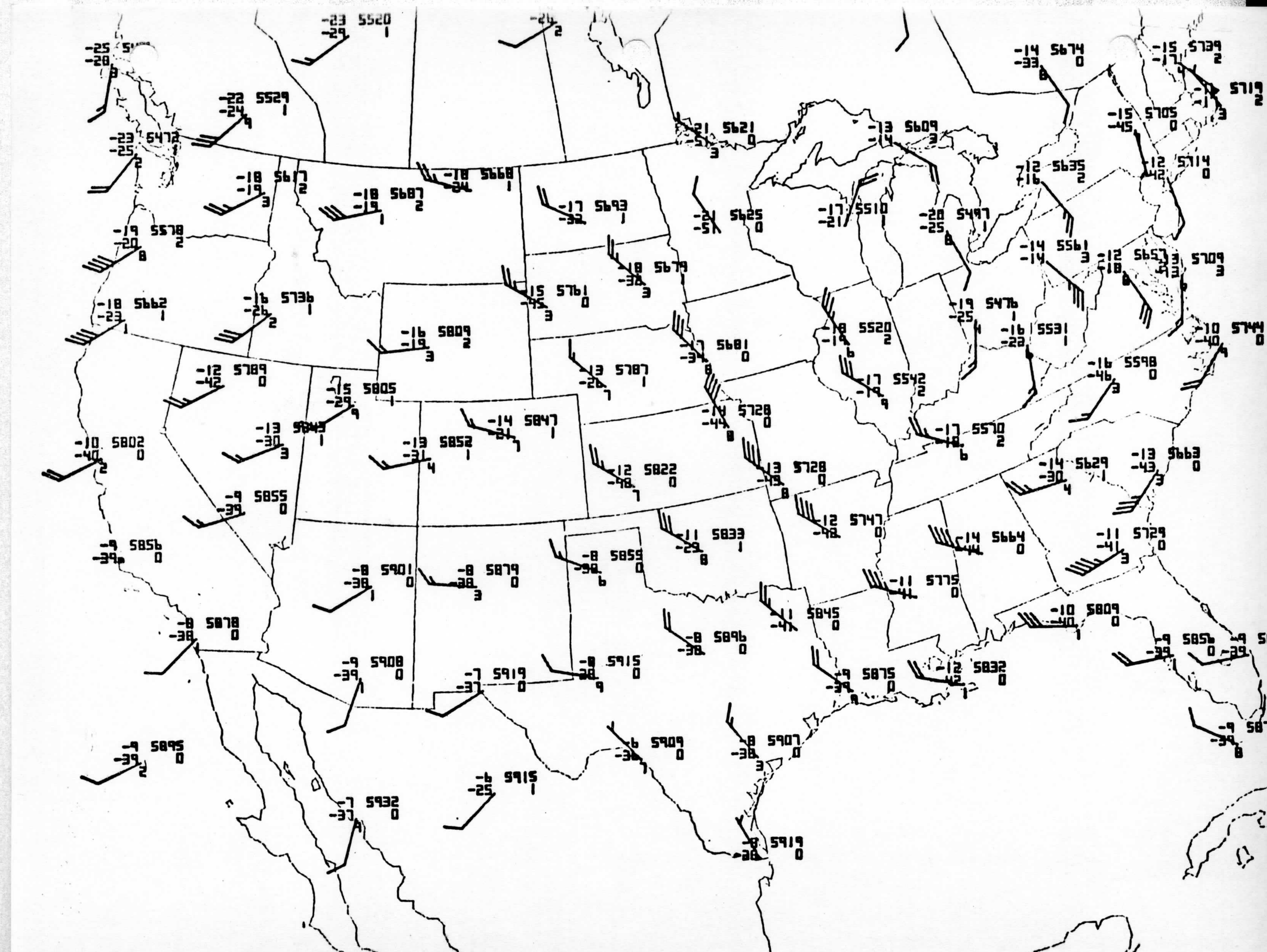

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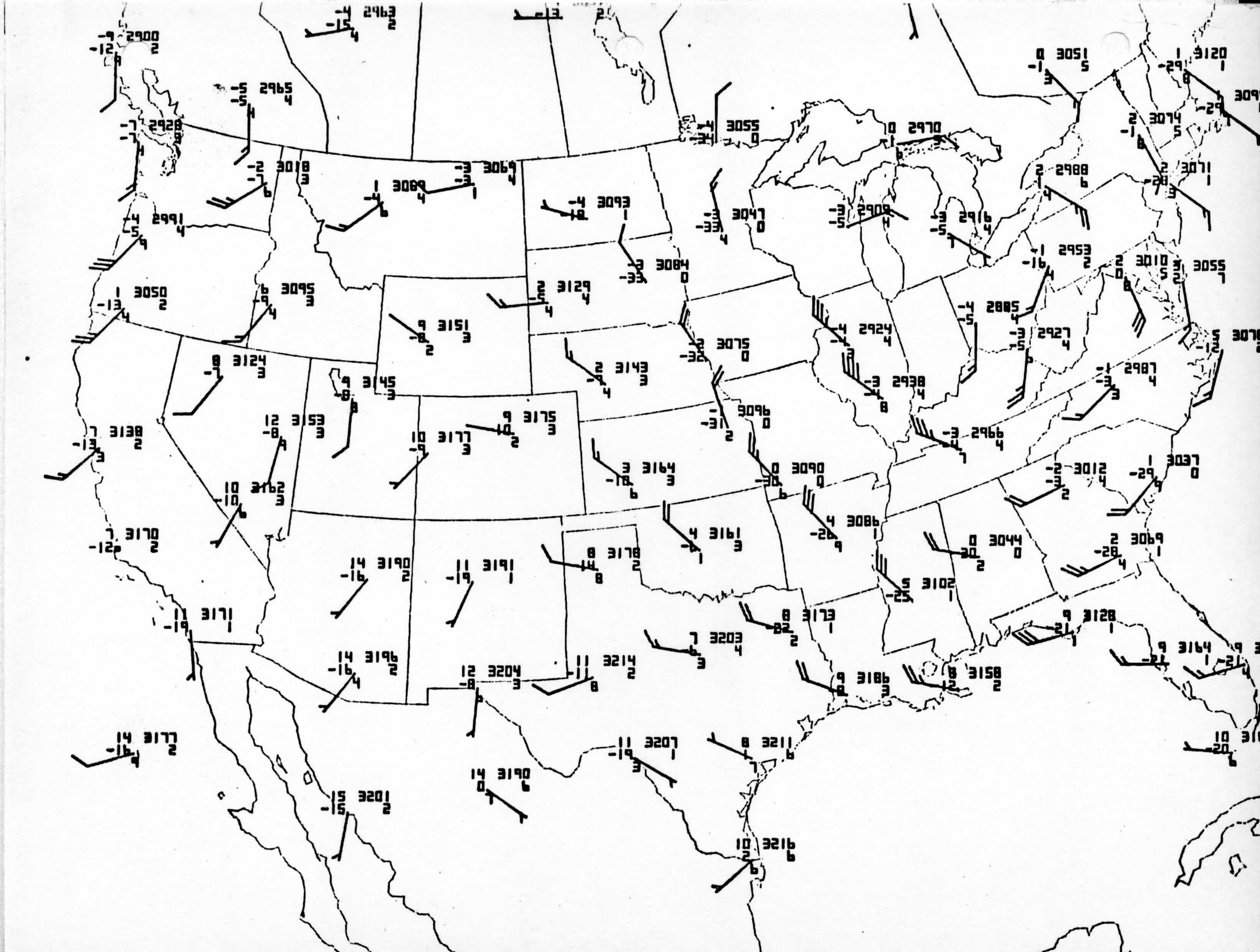

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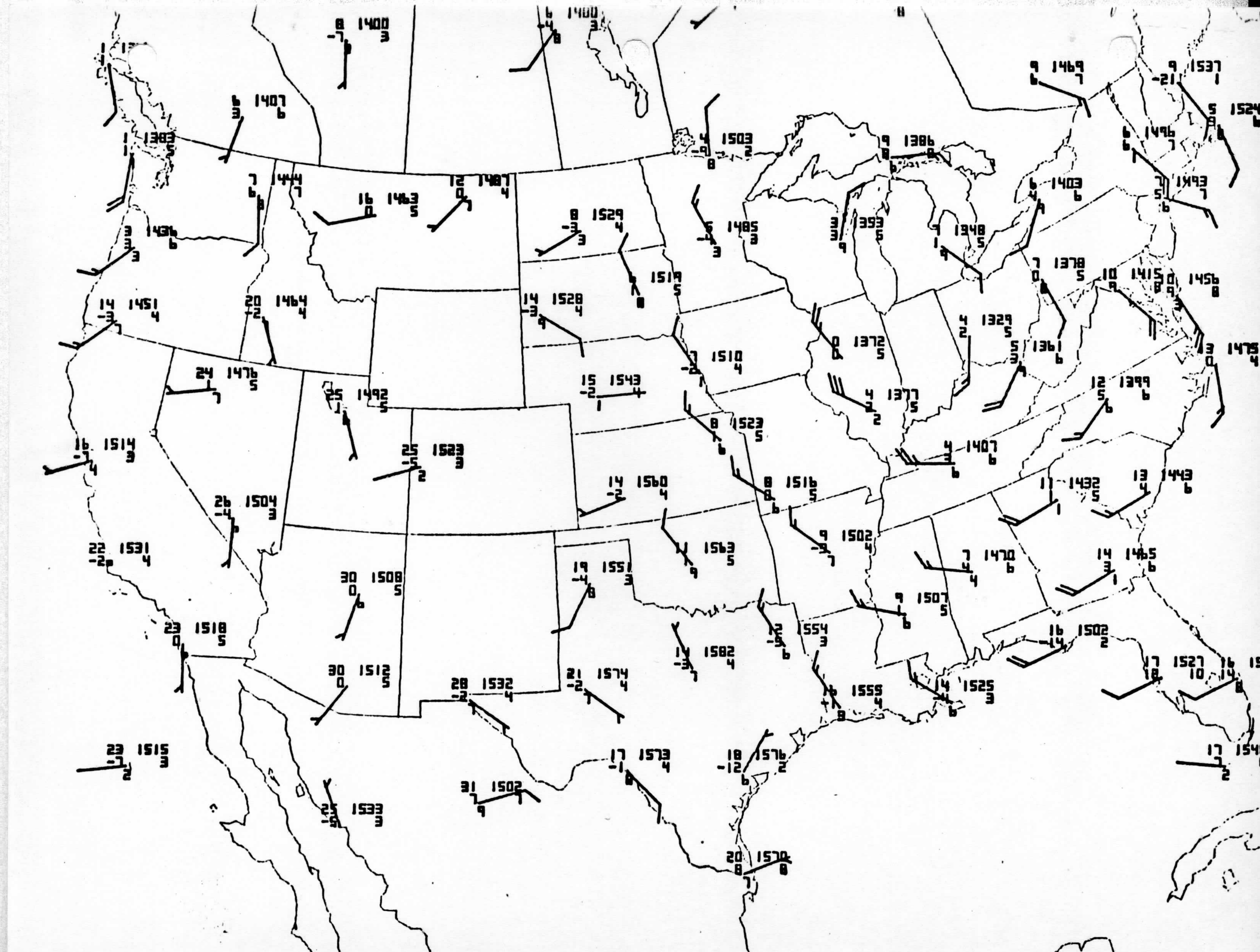

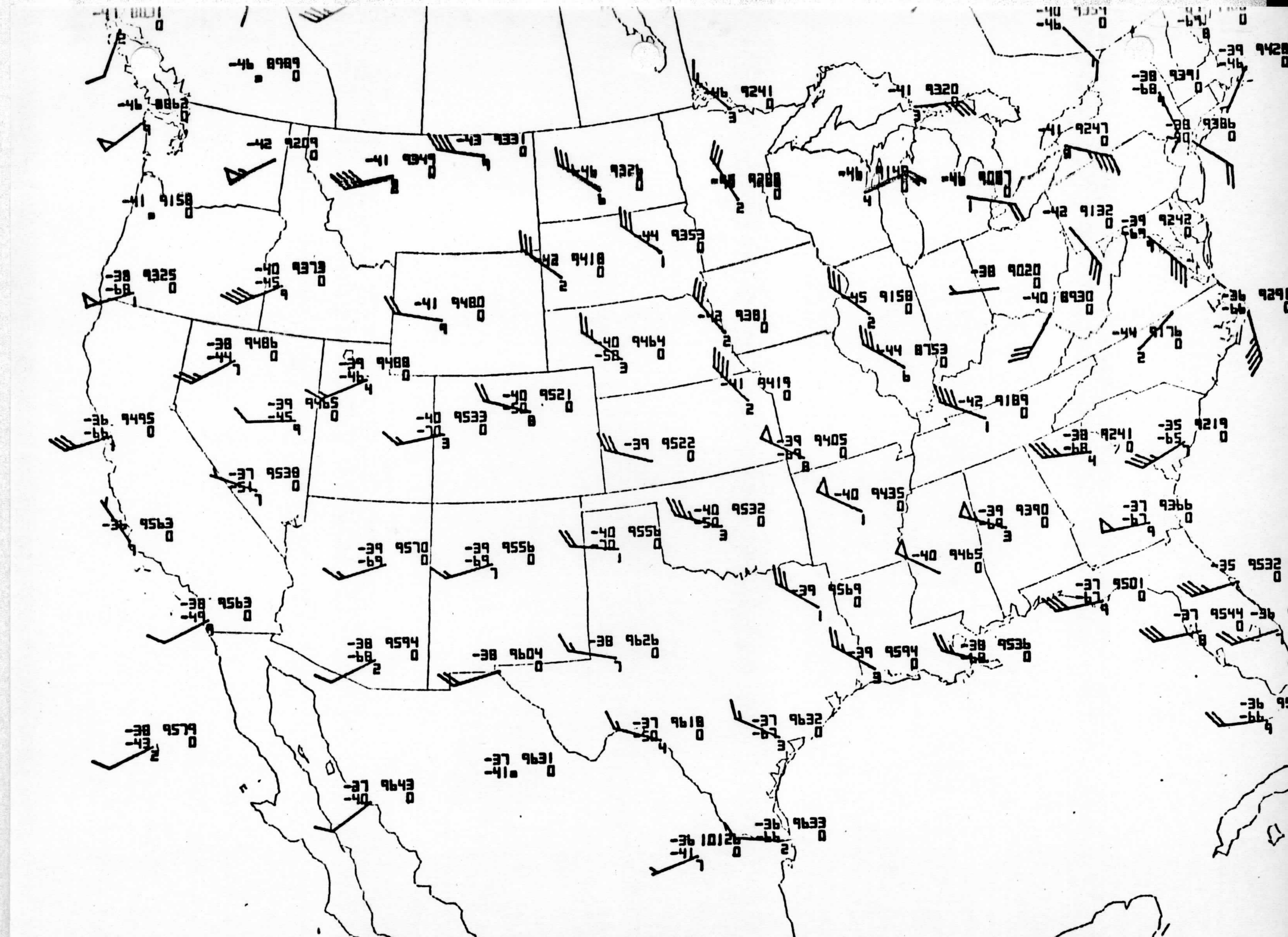

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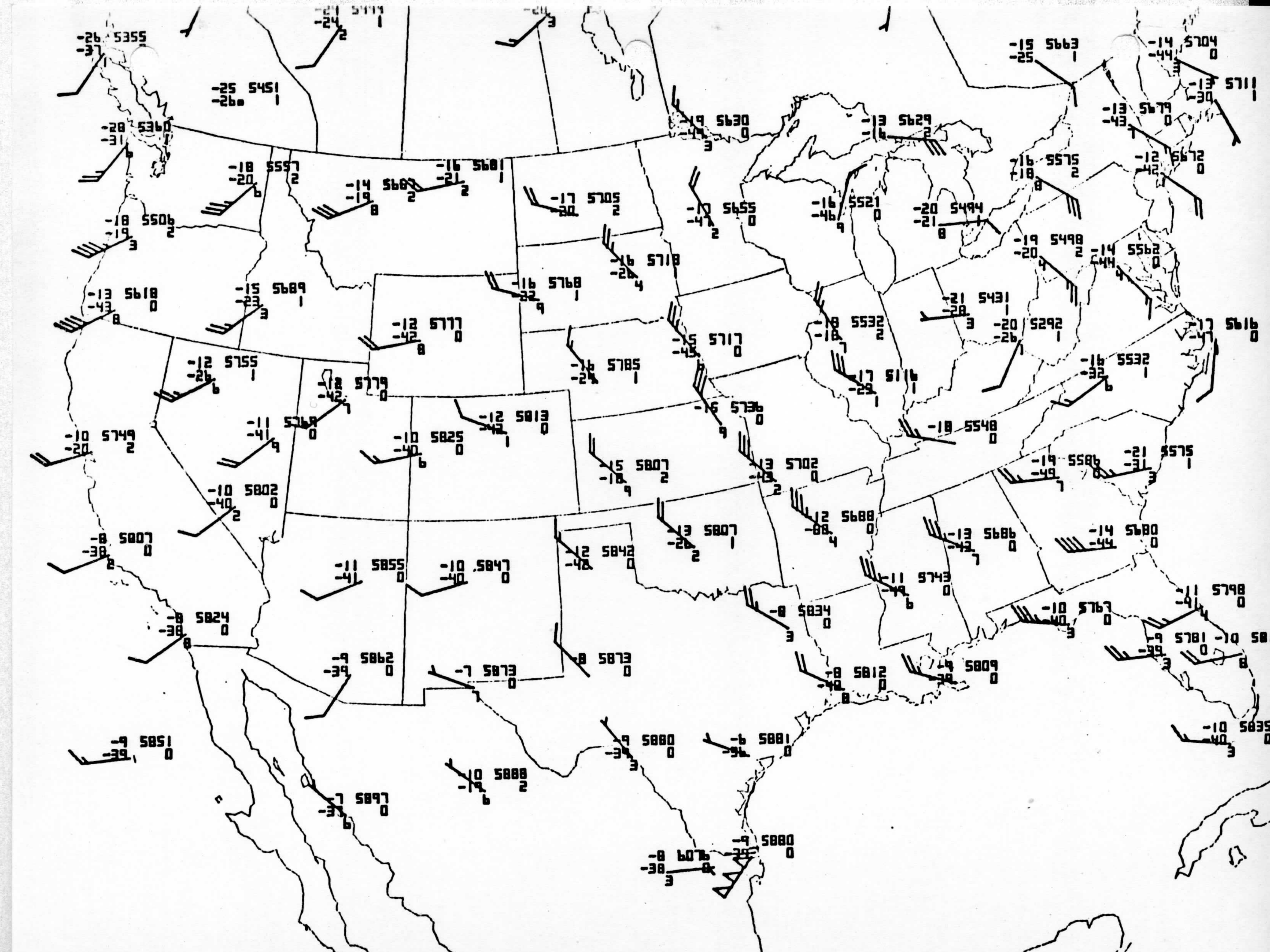

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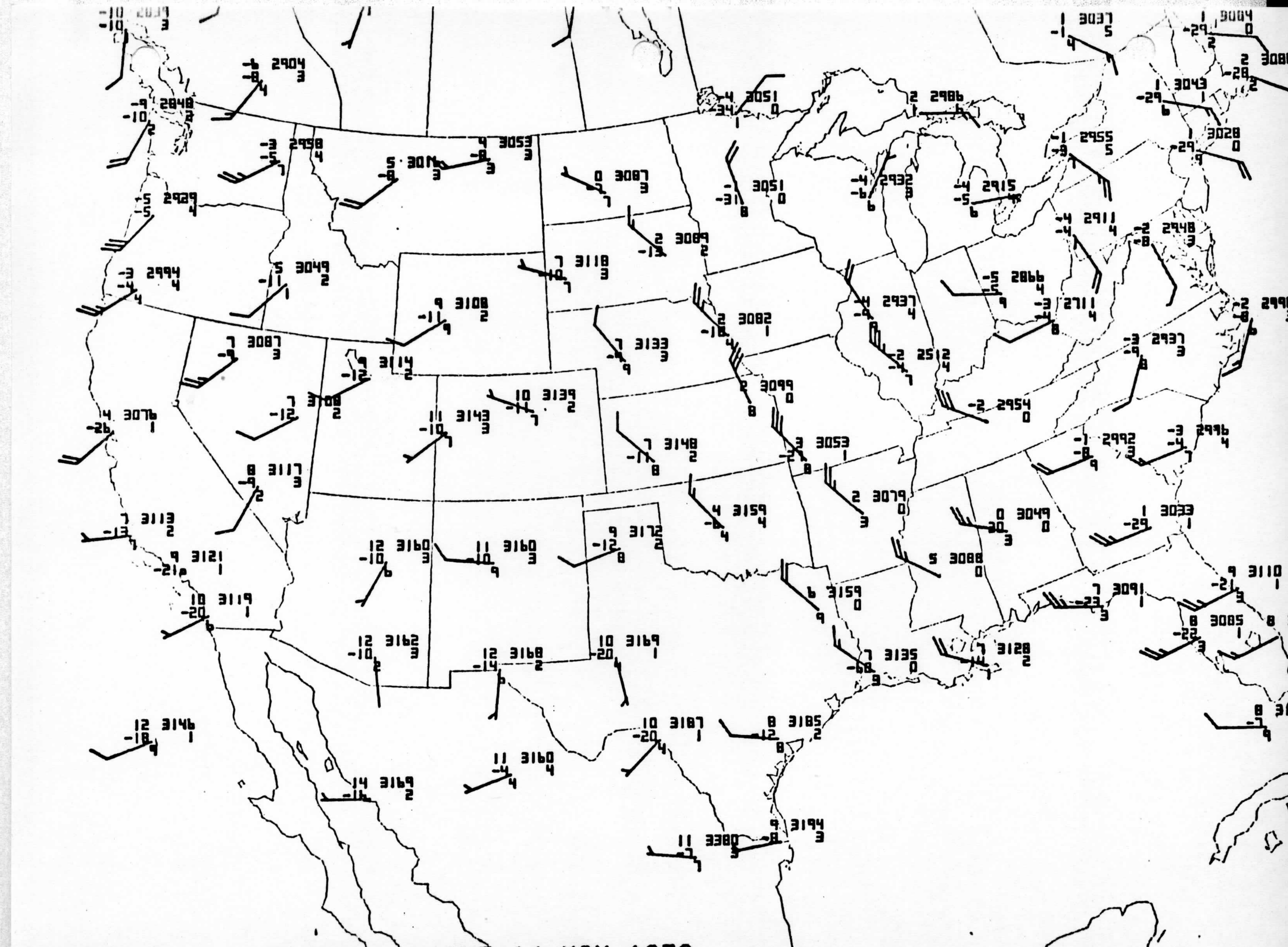

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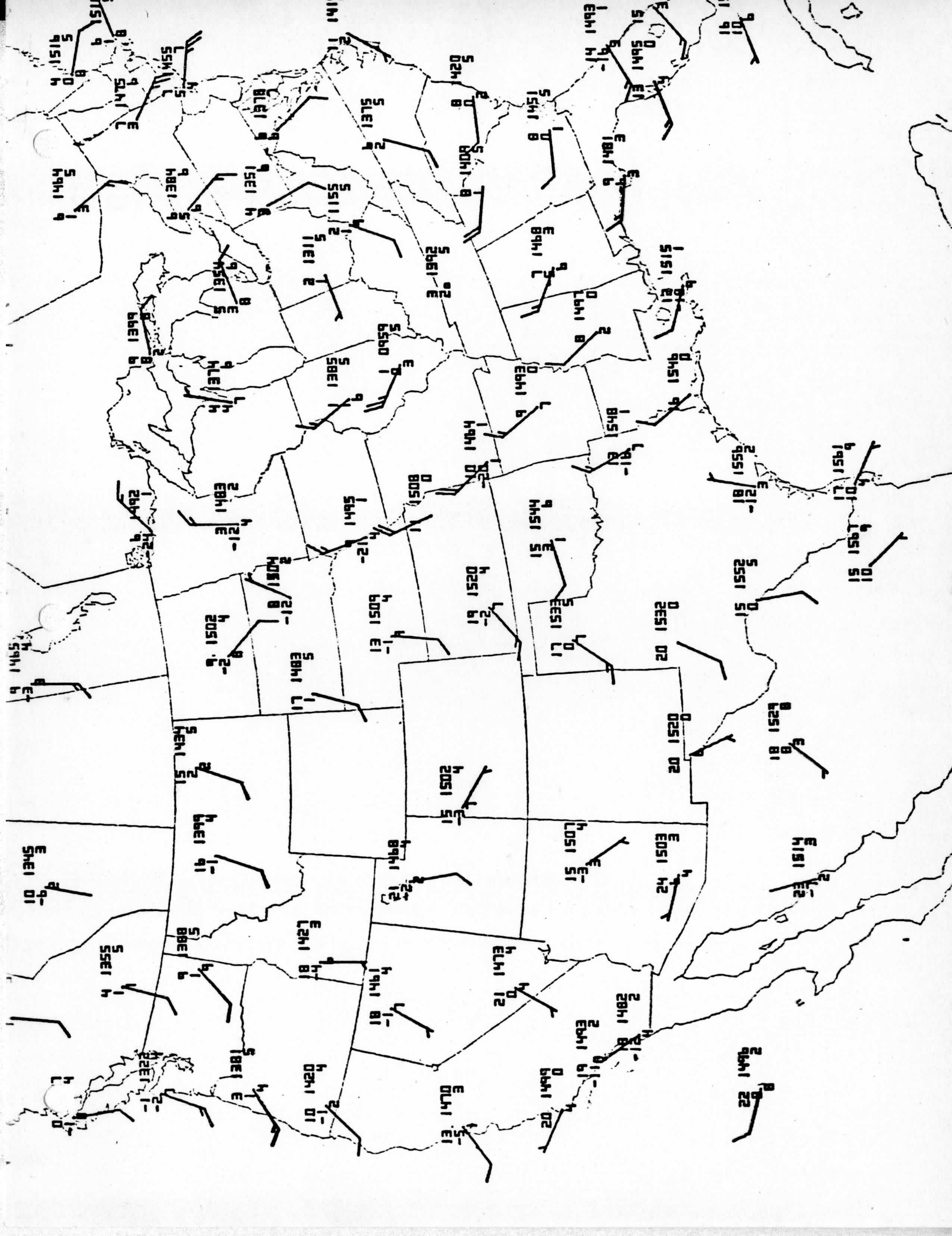

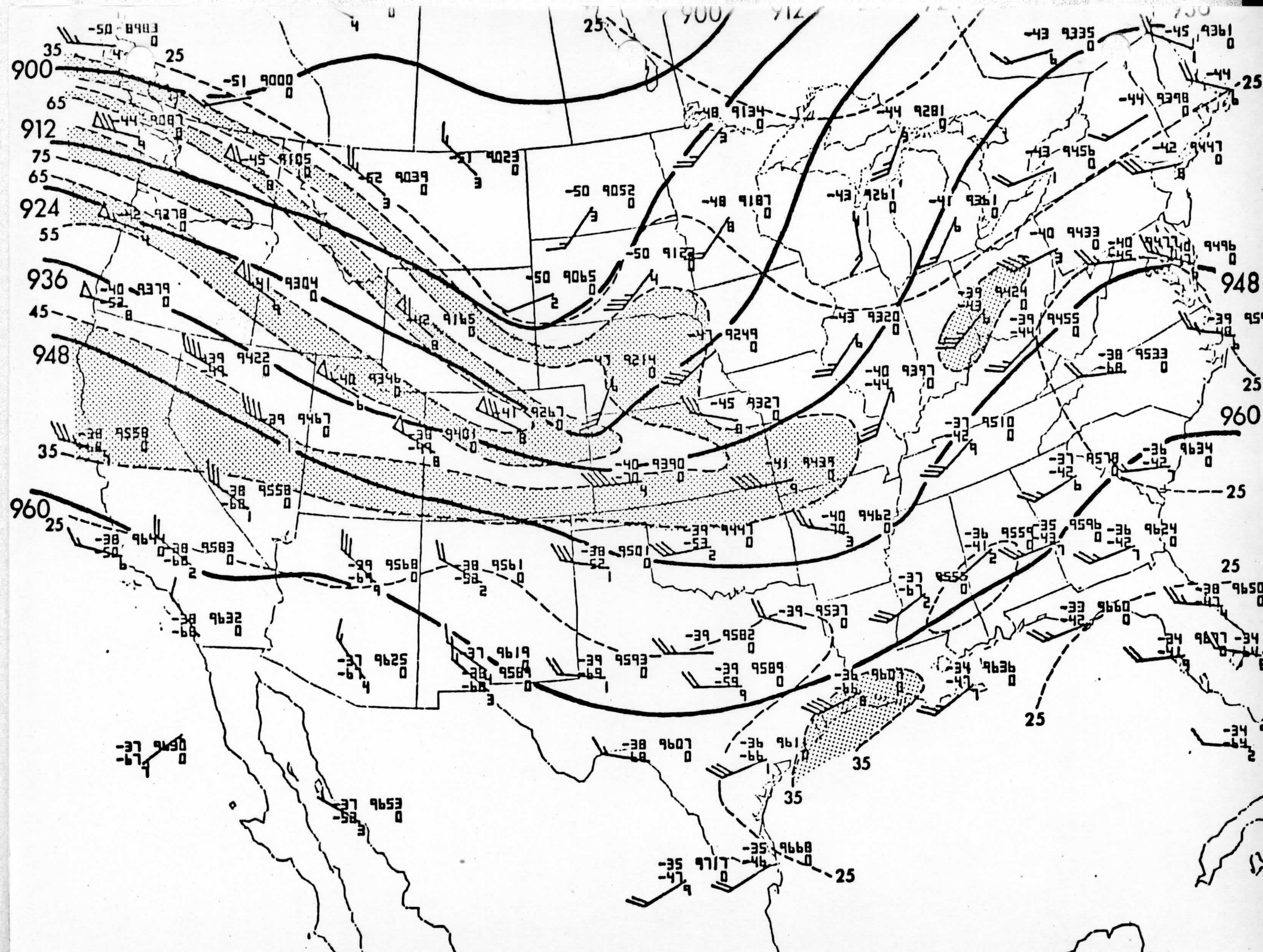

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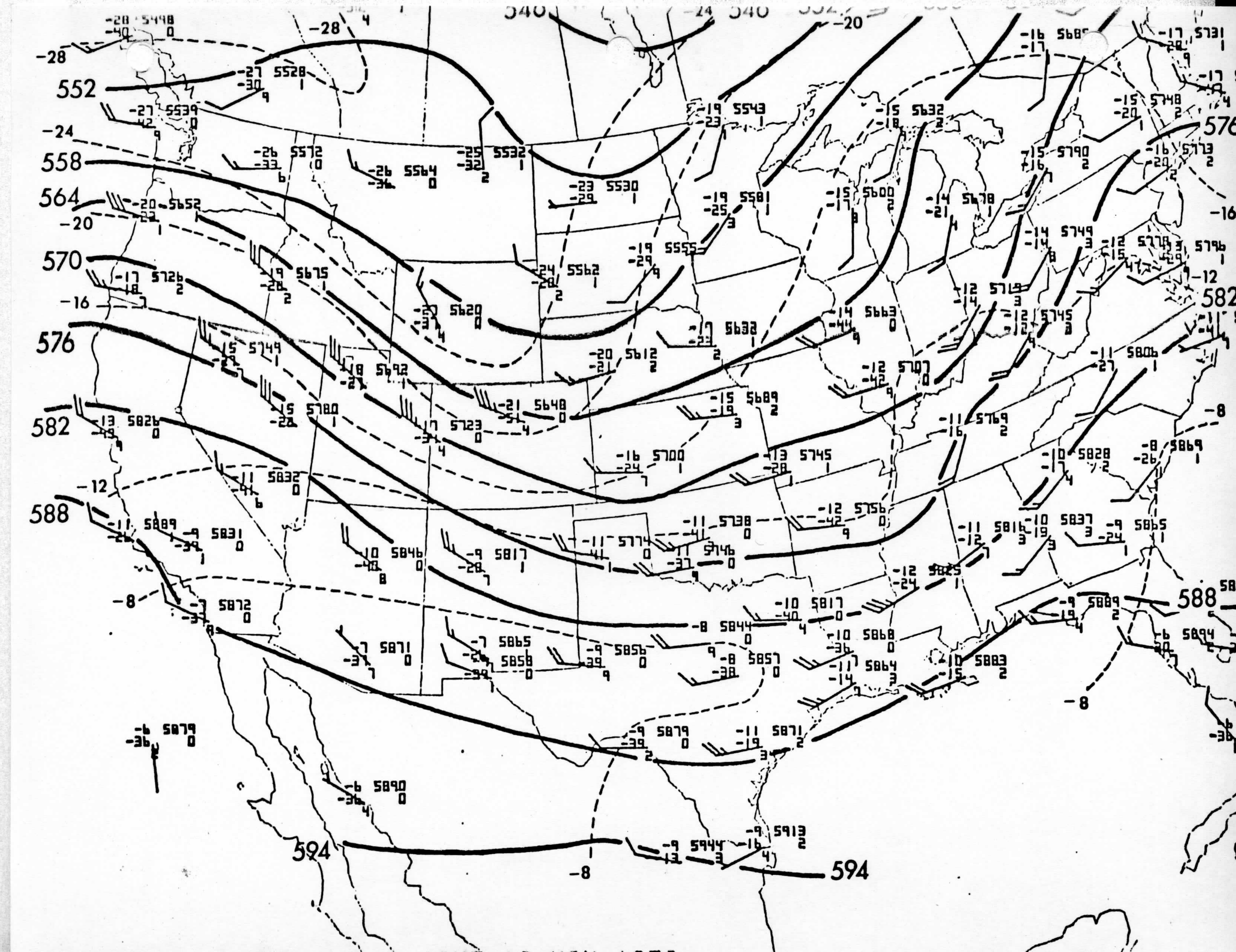
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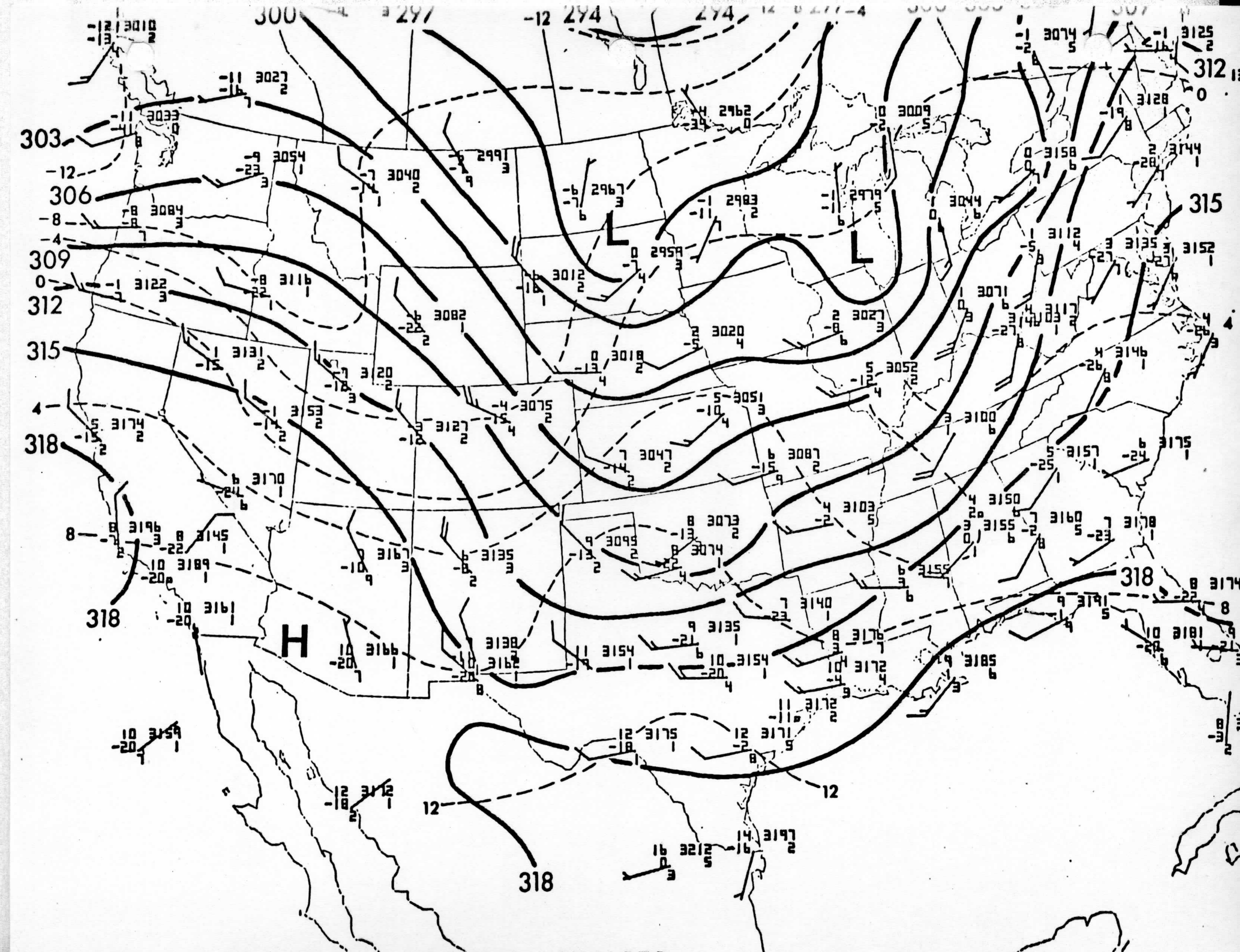

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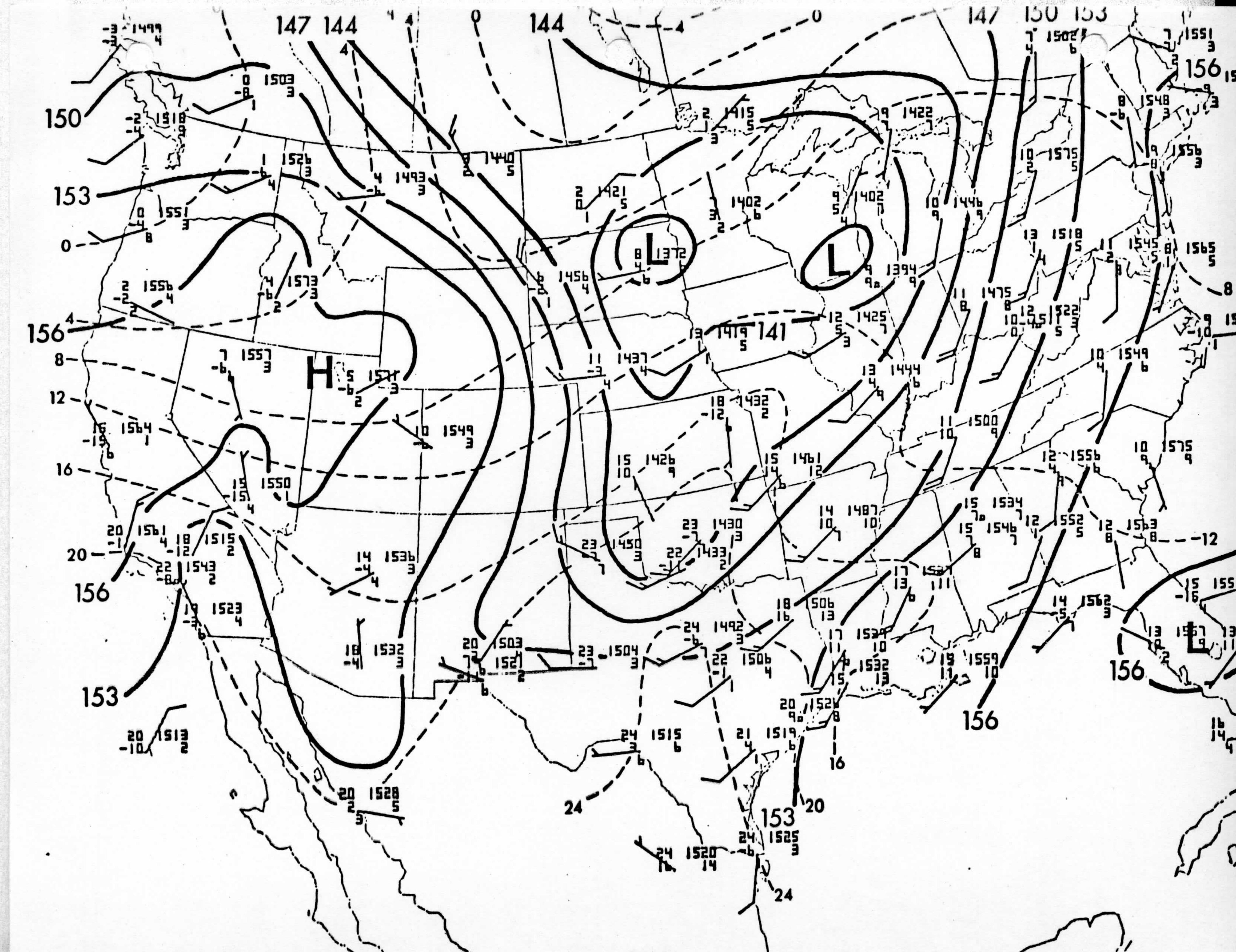

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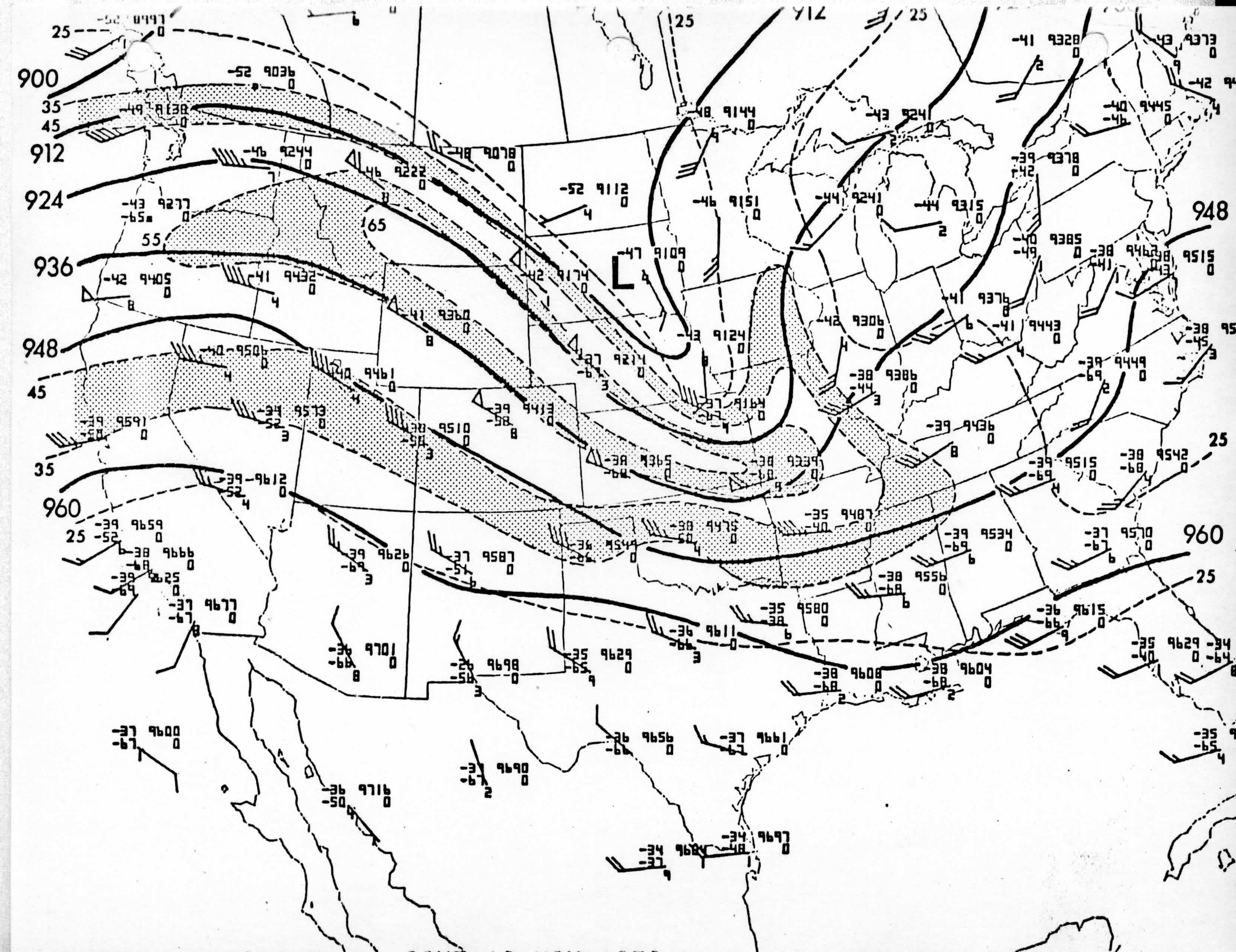
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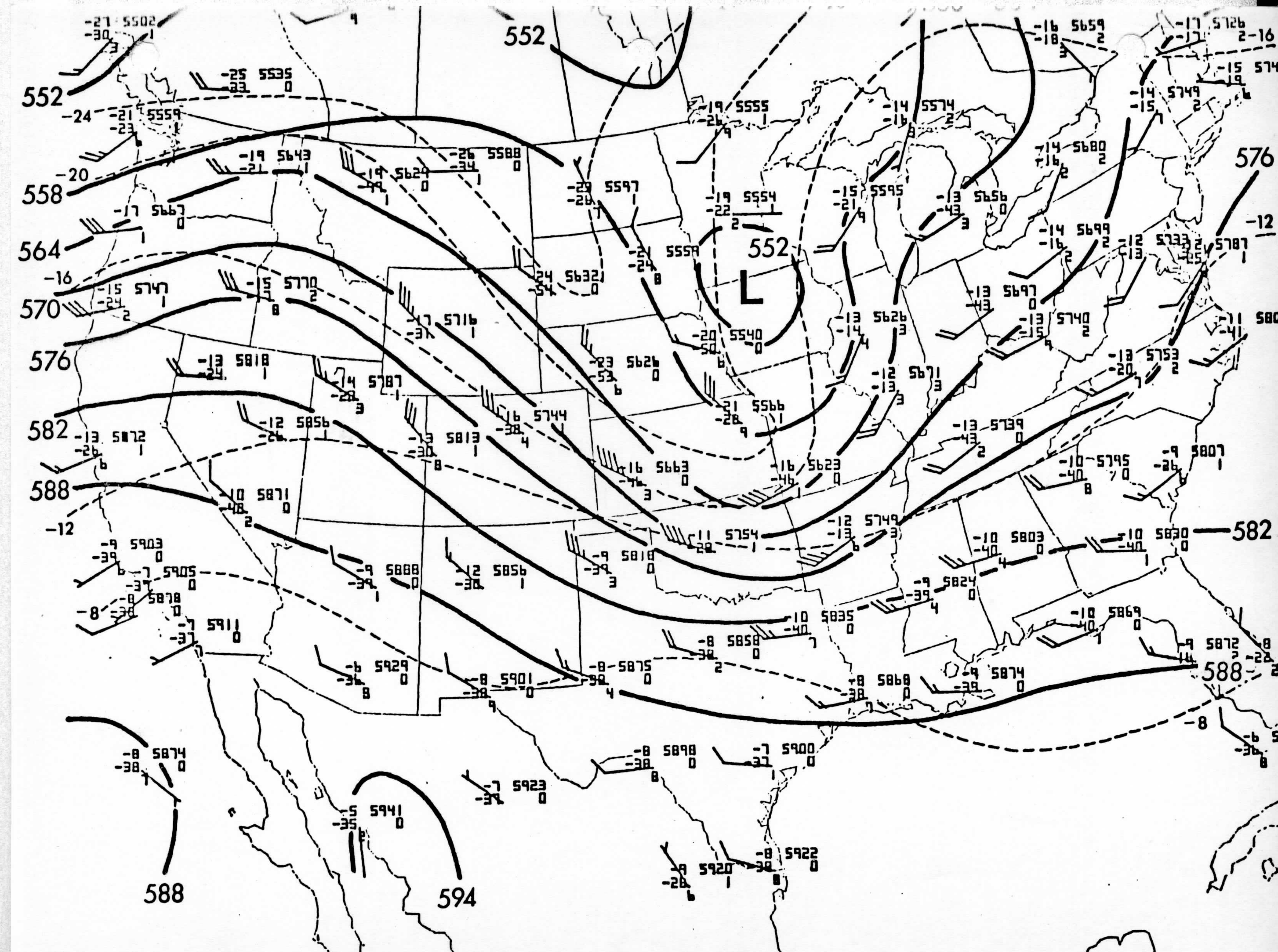
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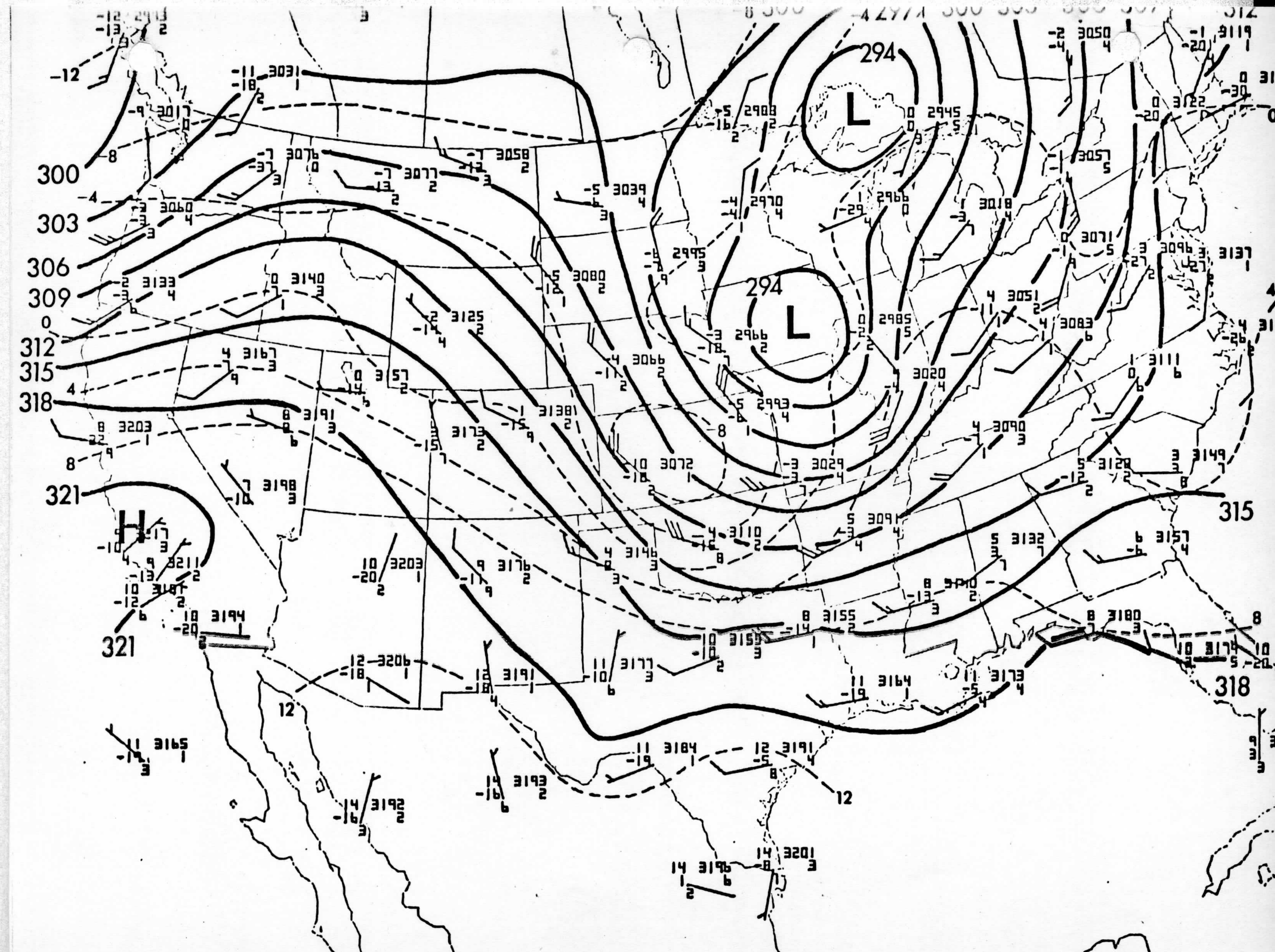

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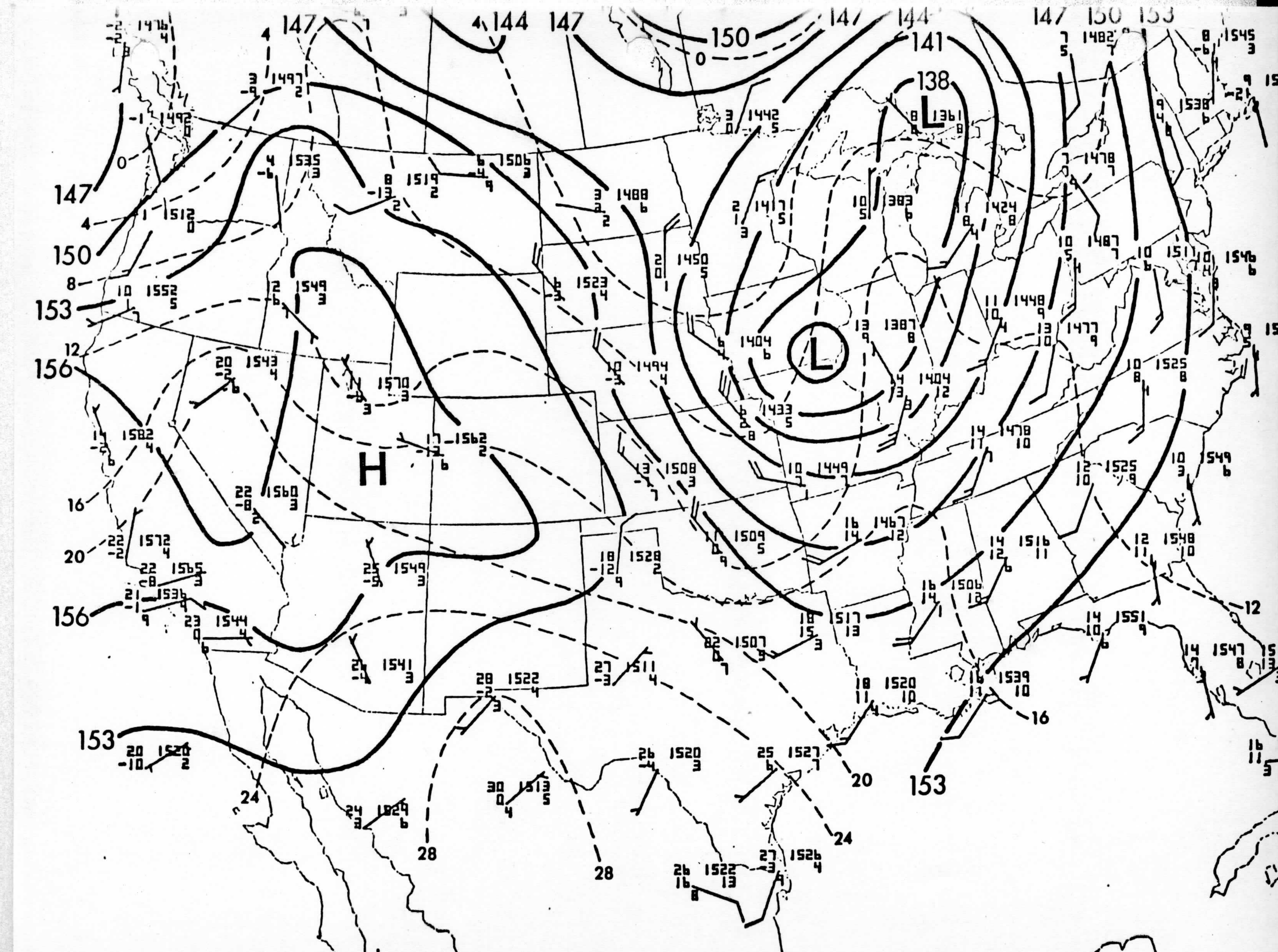

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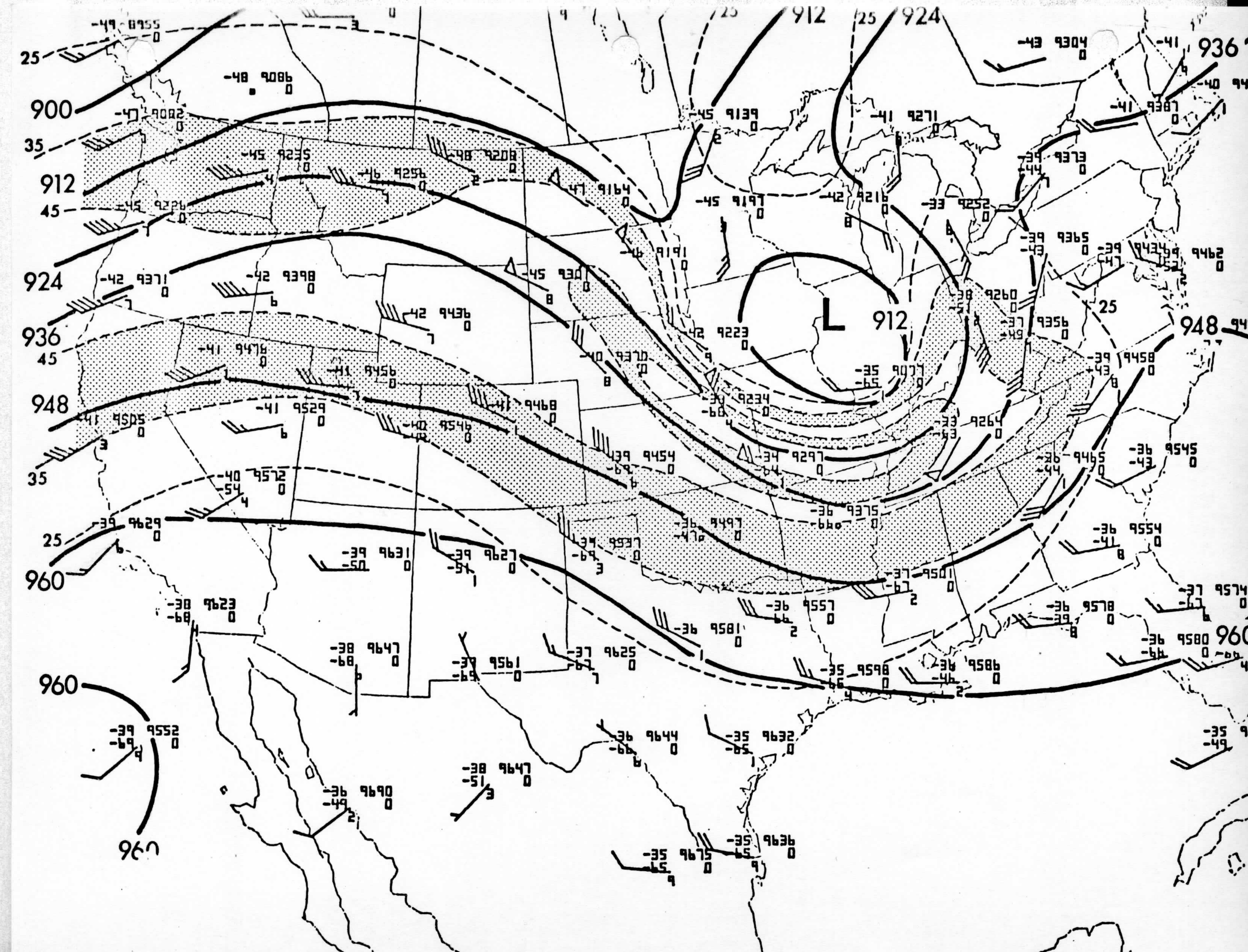

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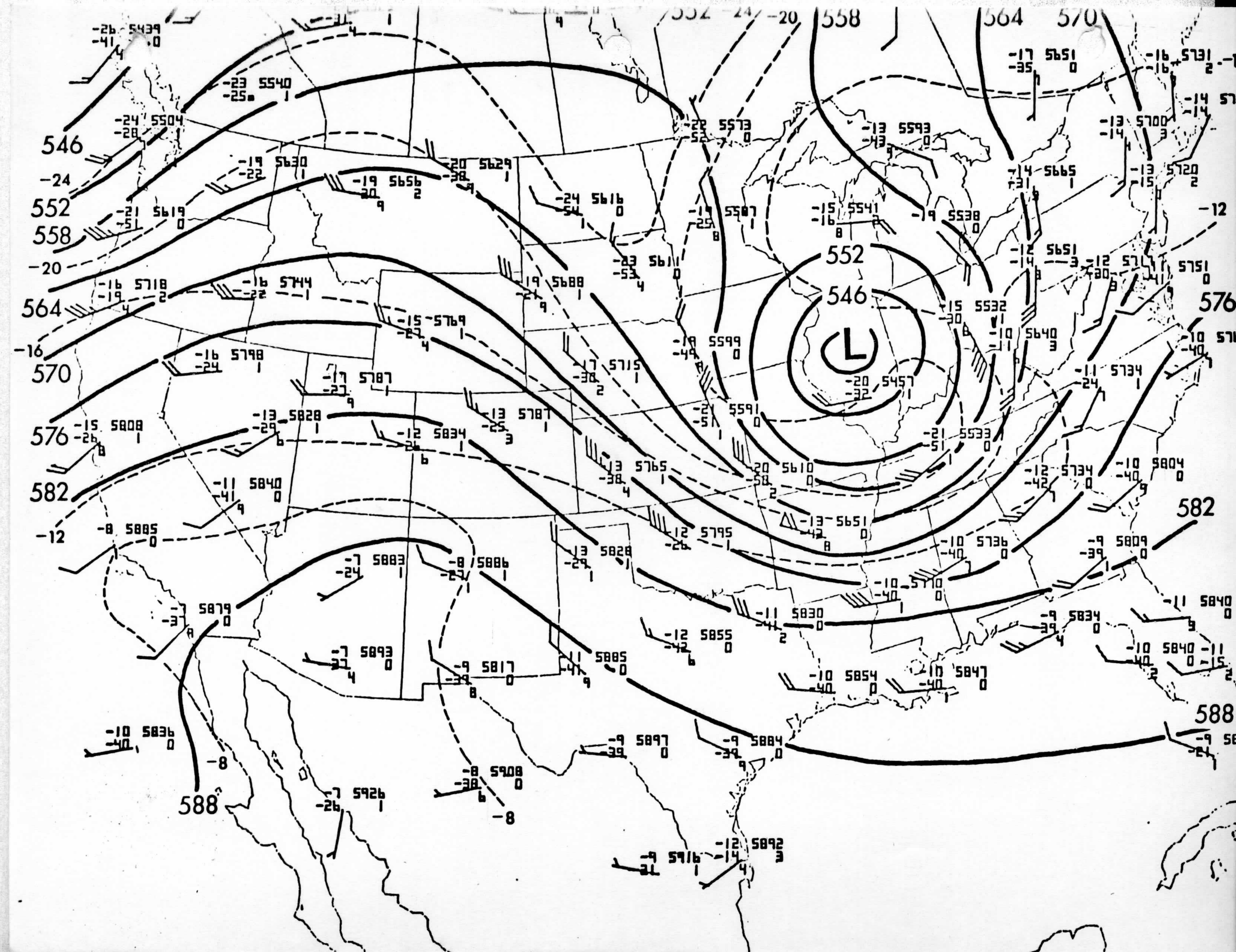
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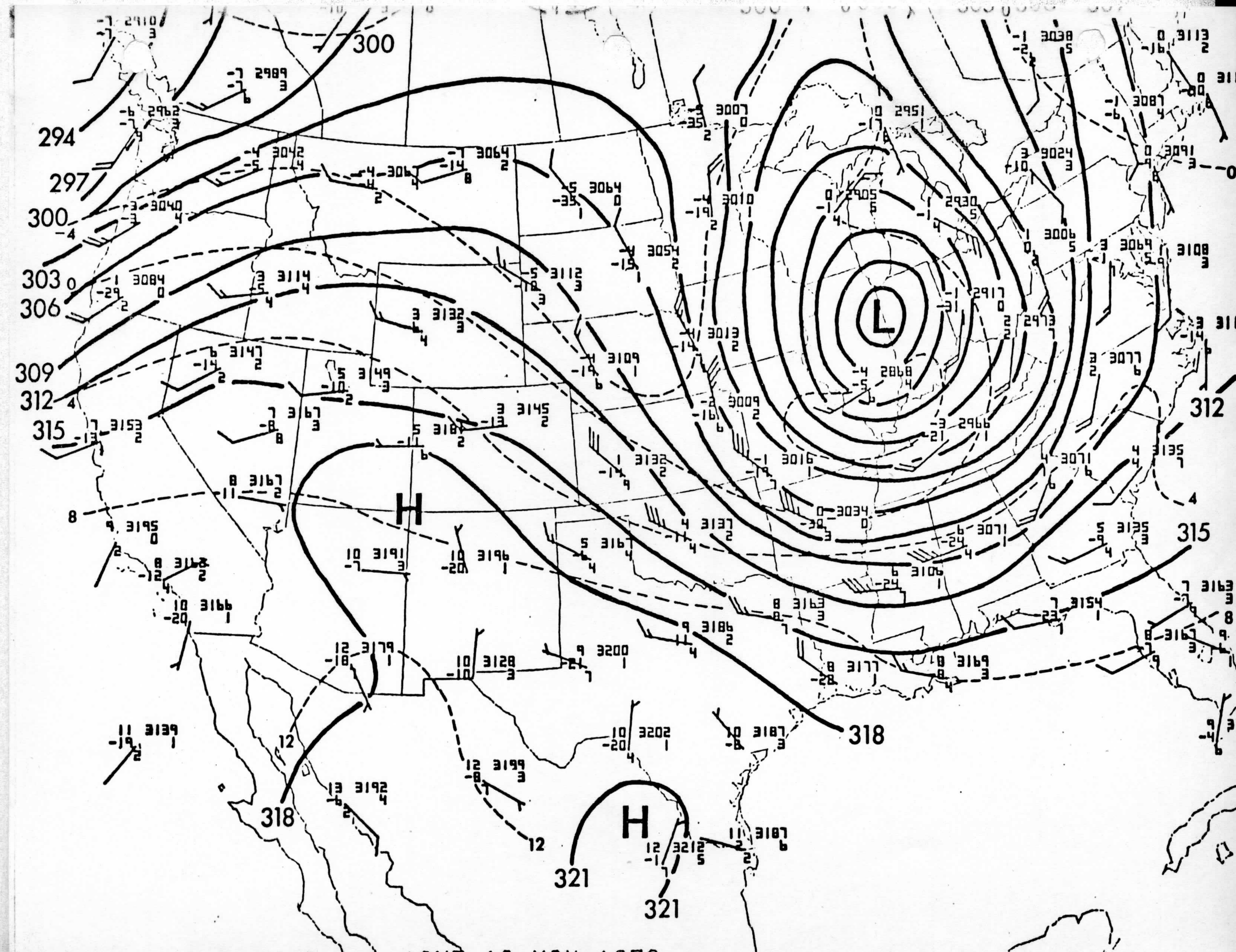
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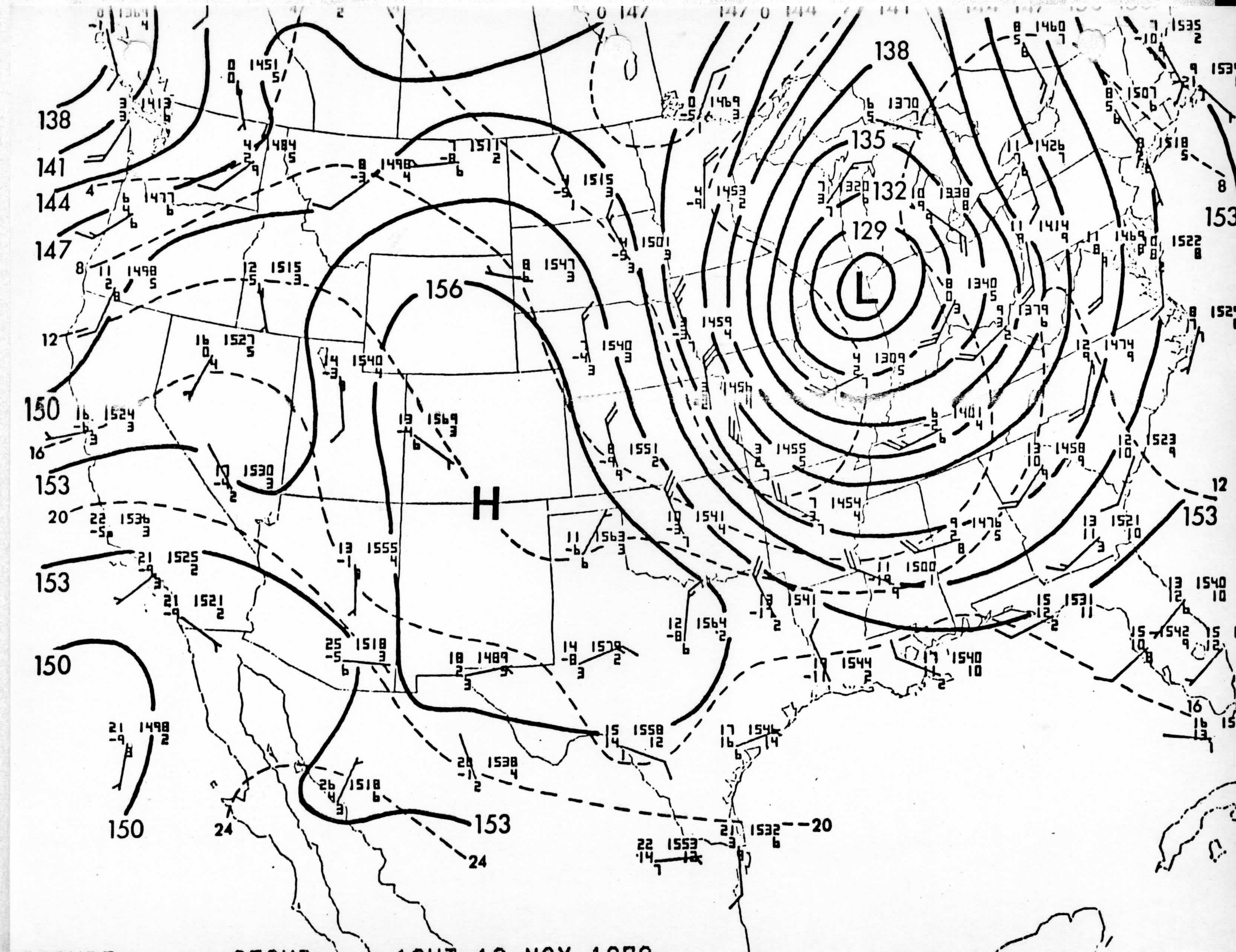

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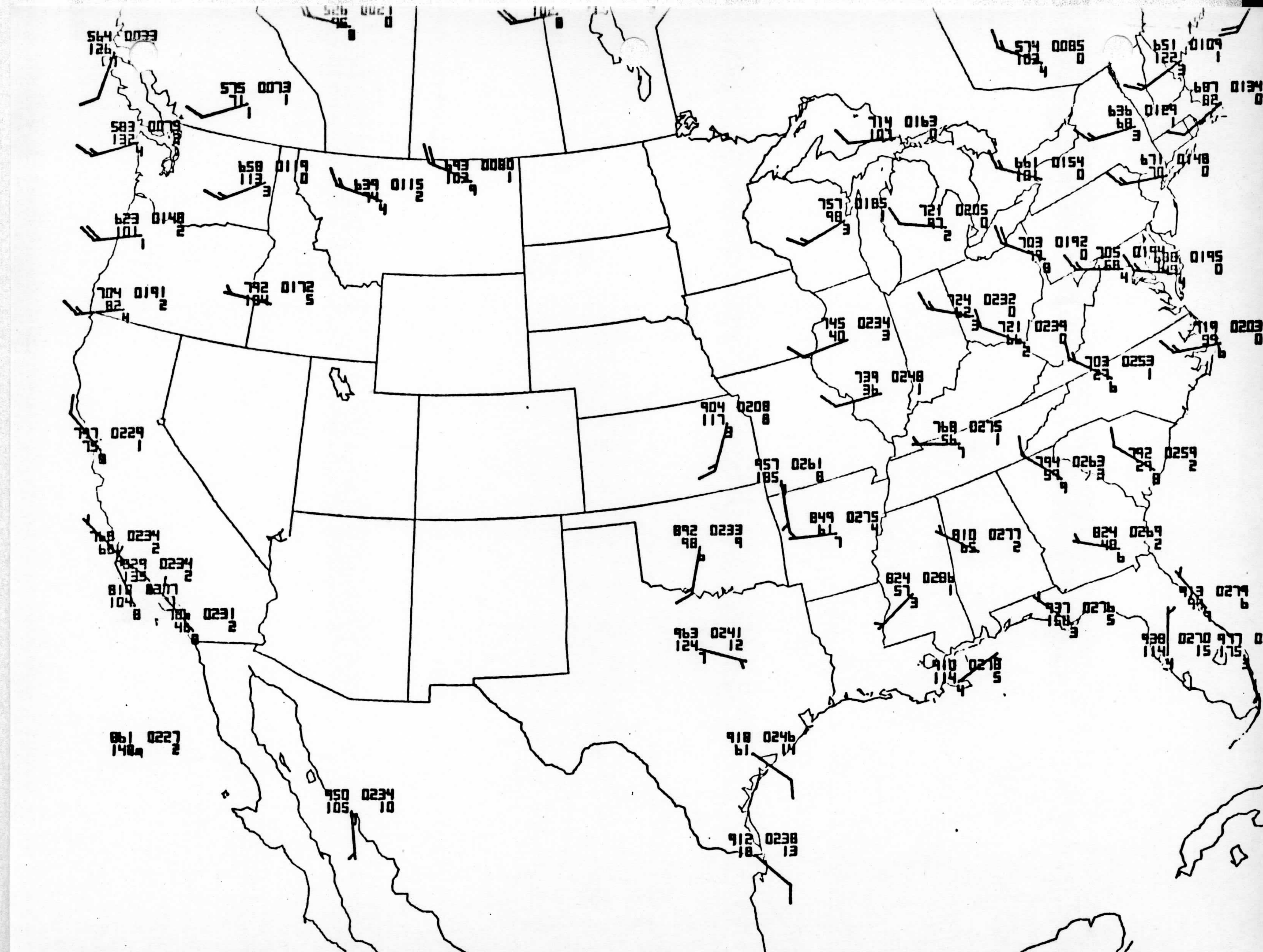

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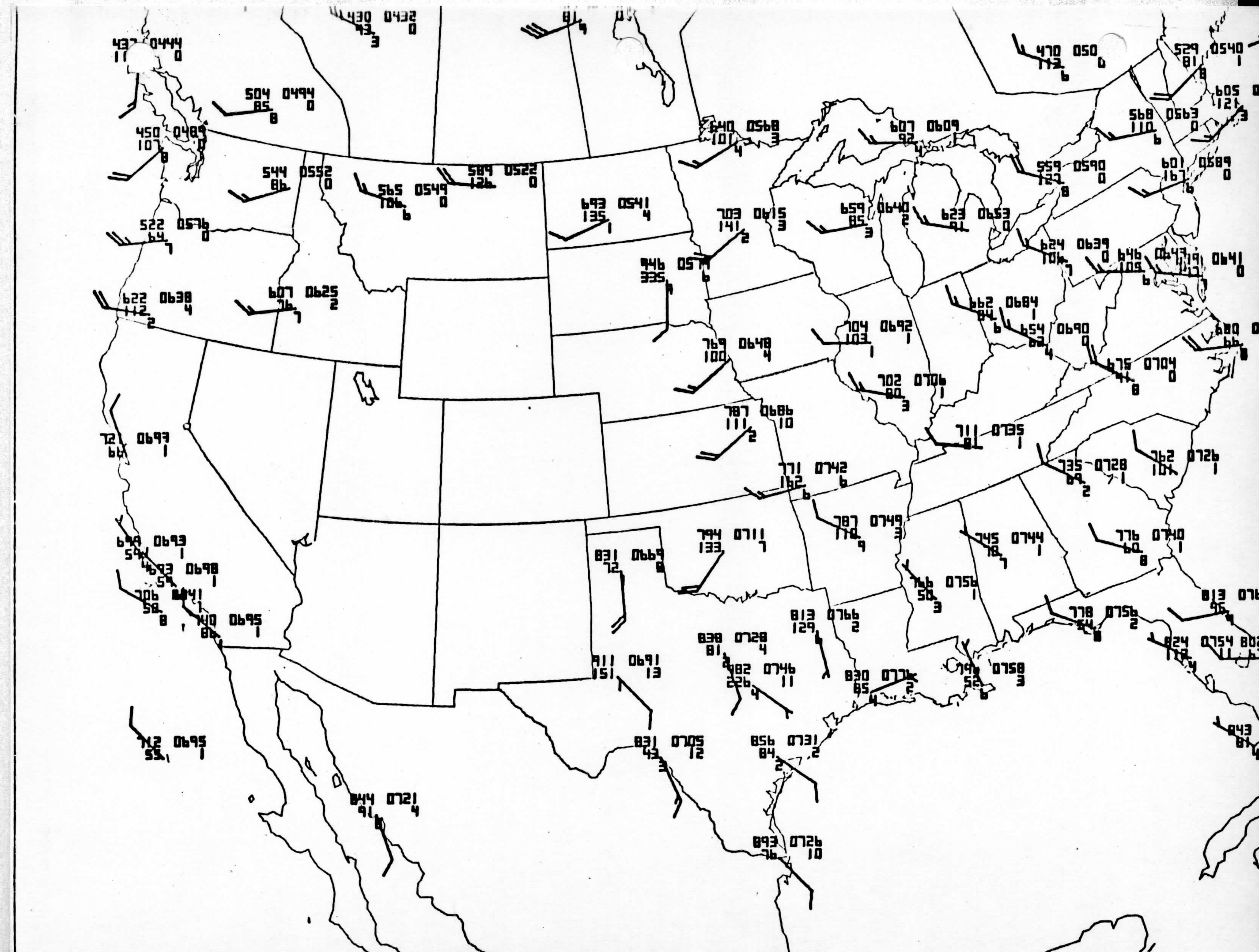

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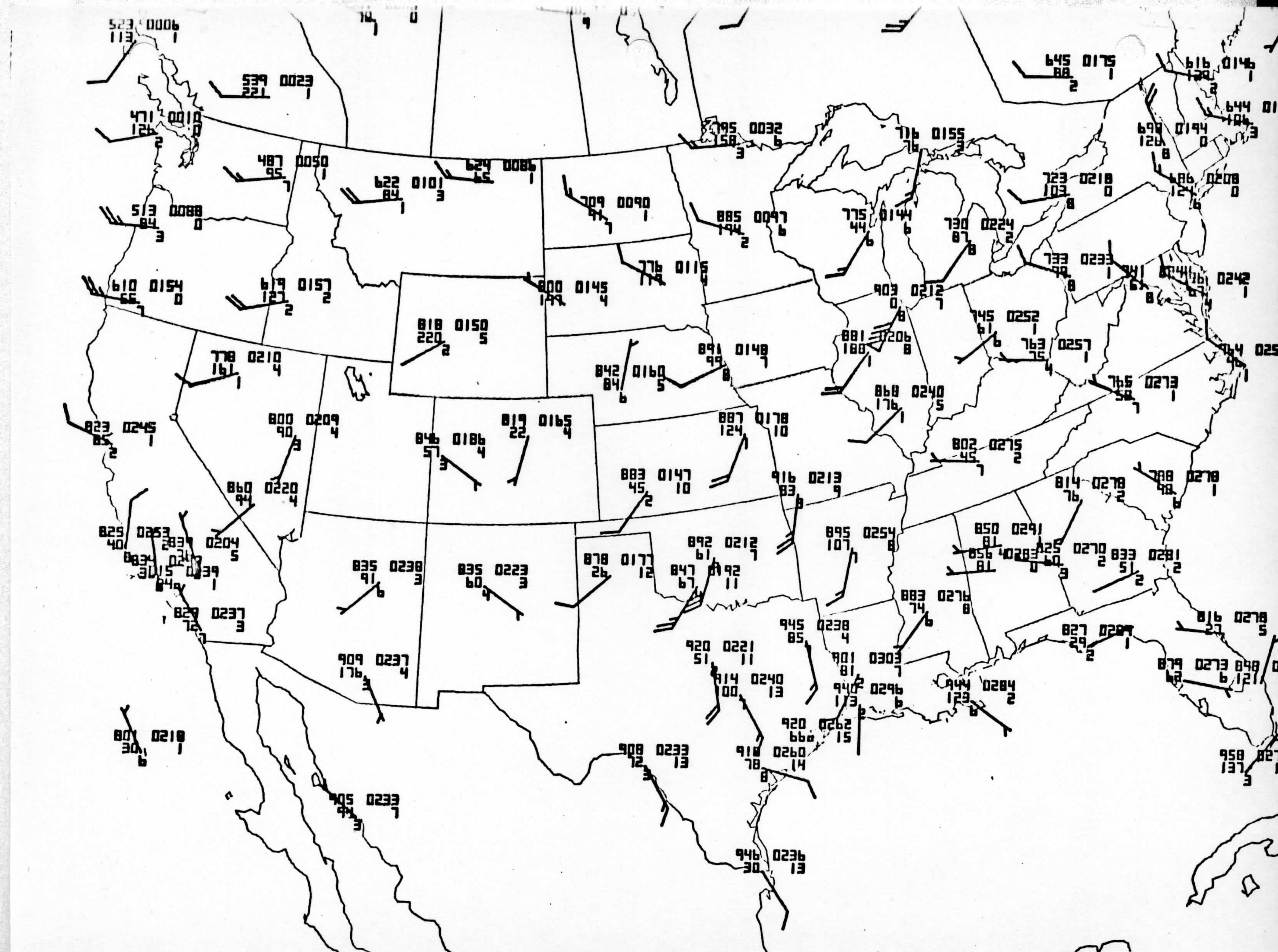

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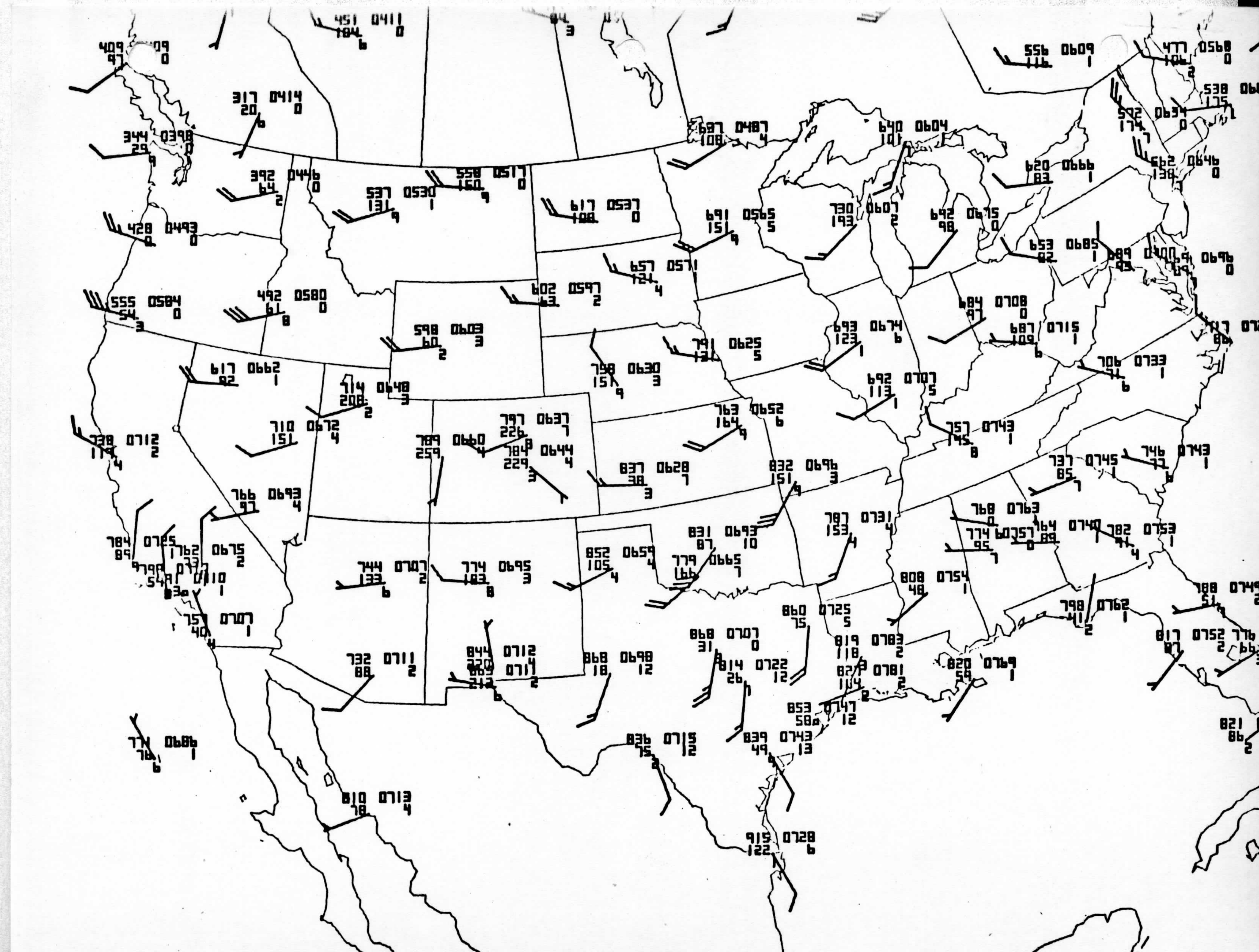

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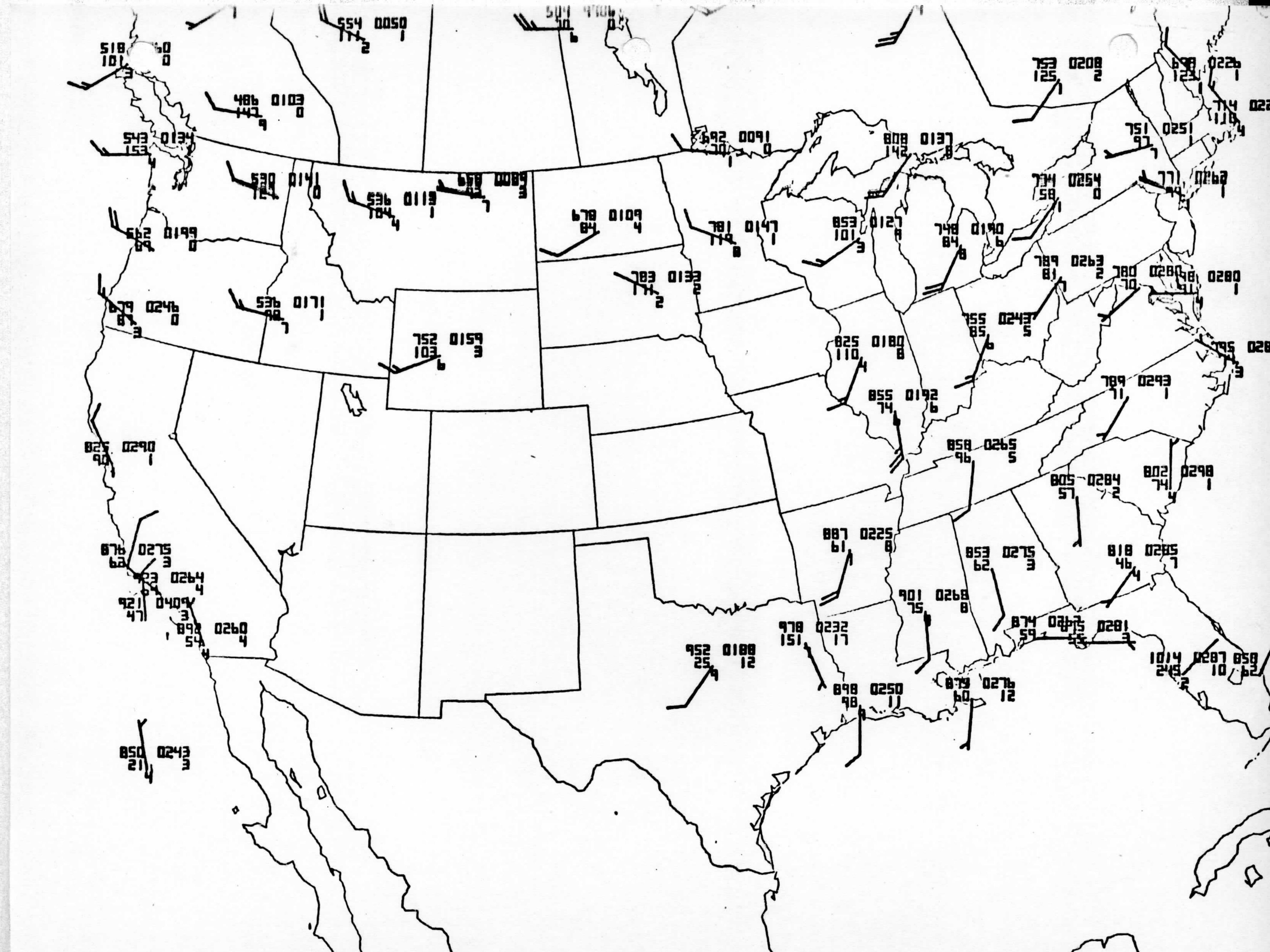

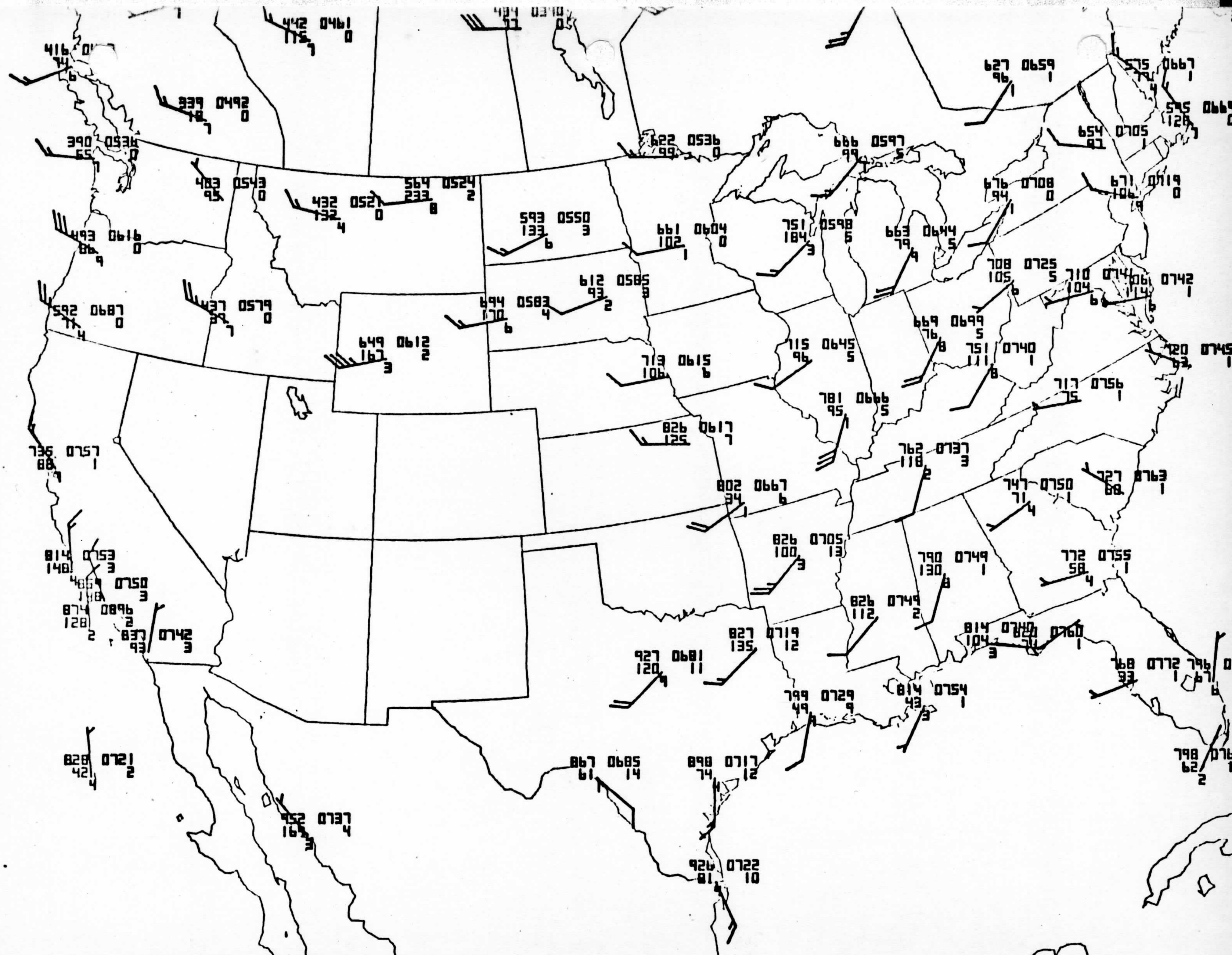


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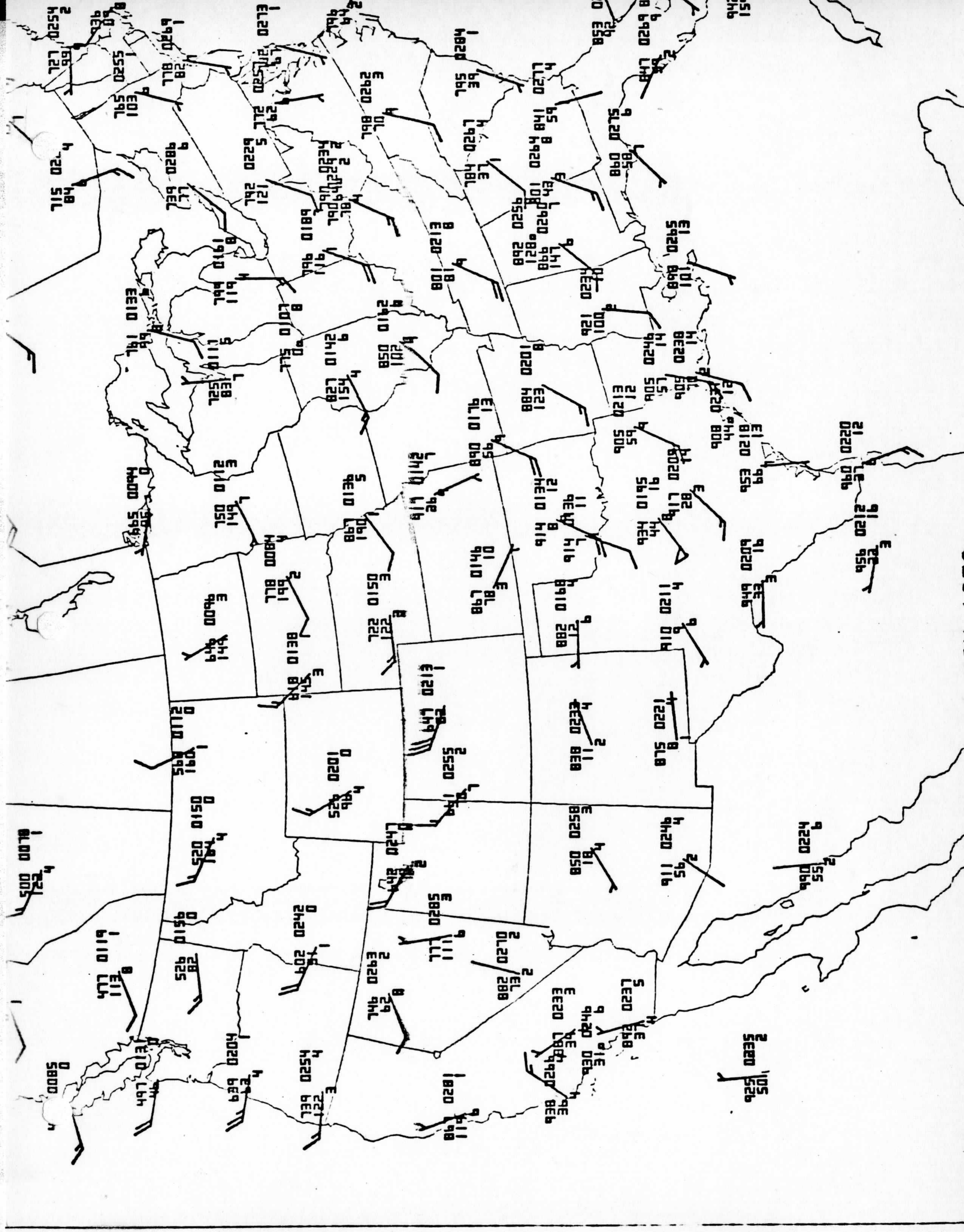
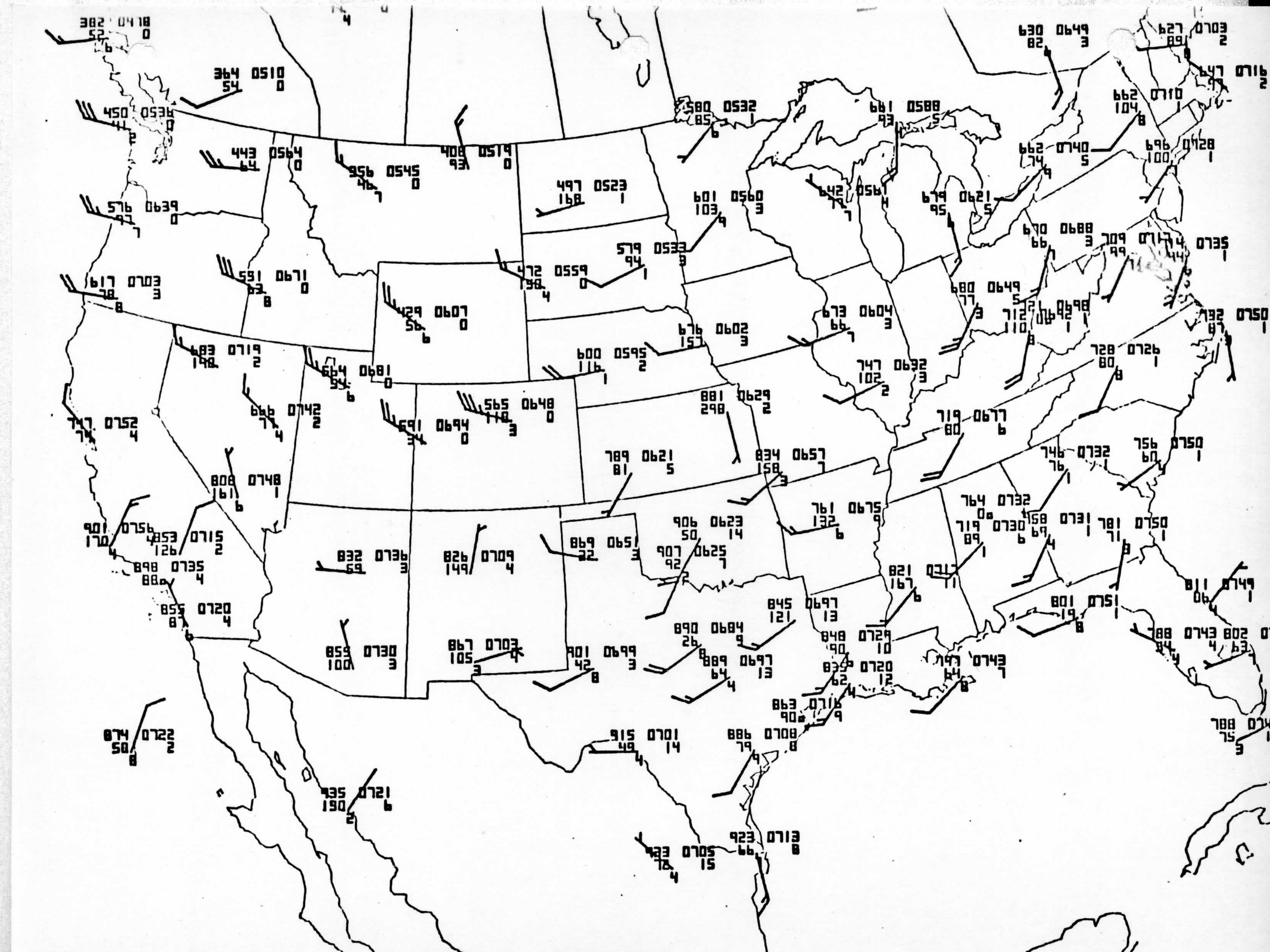
10 MAY 1978





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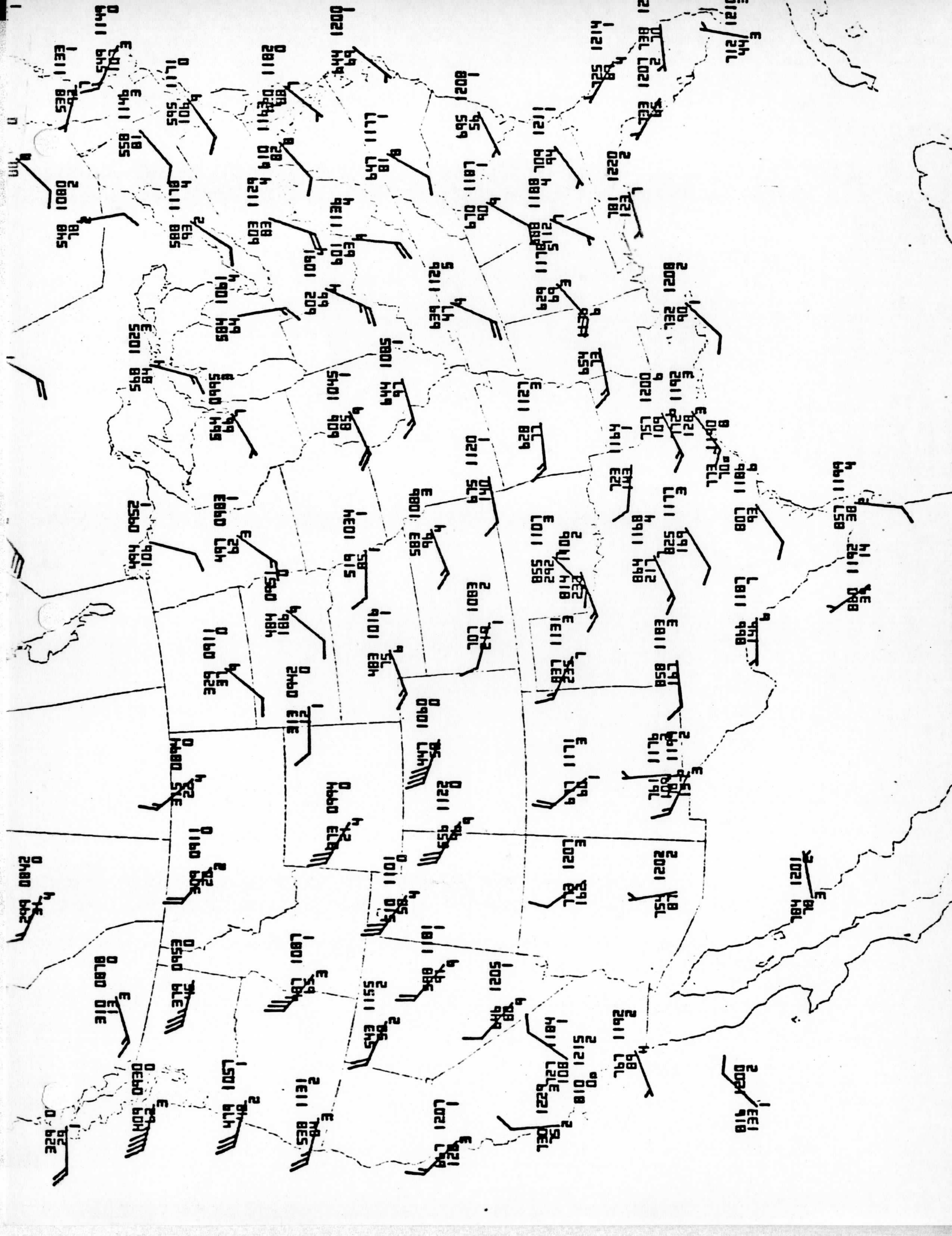

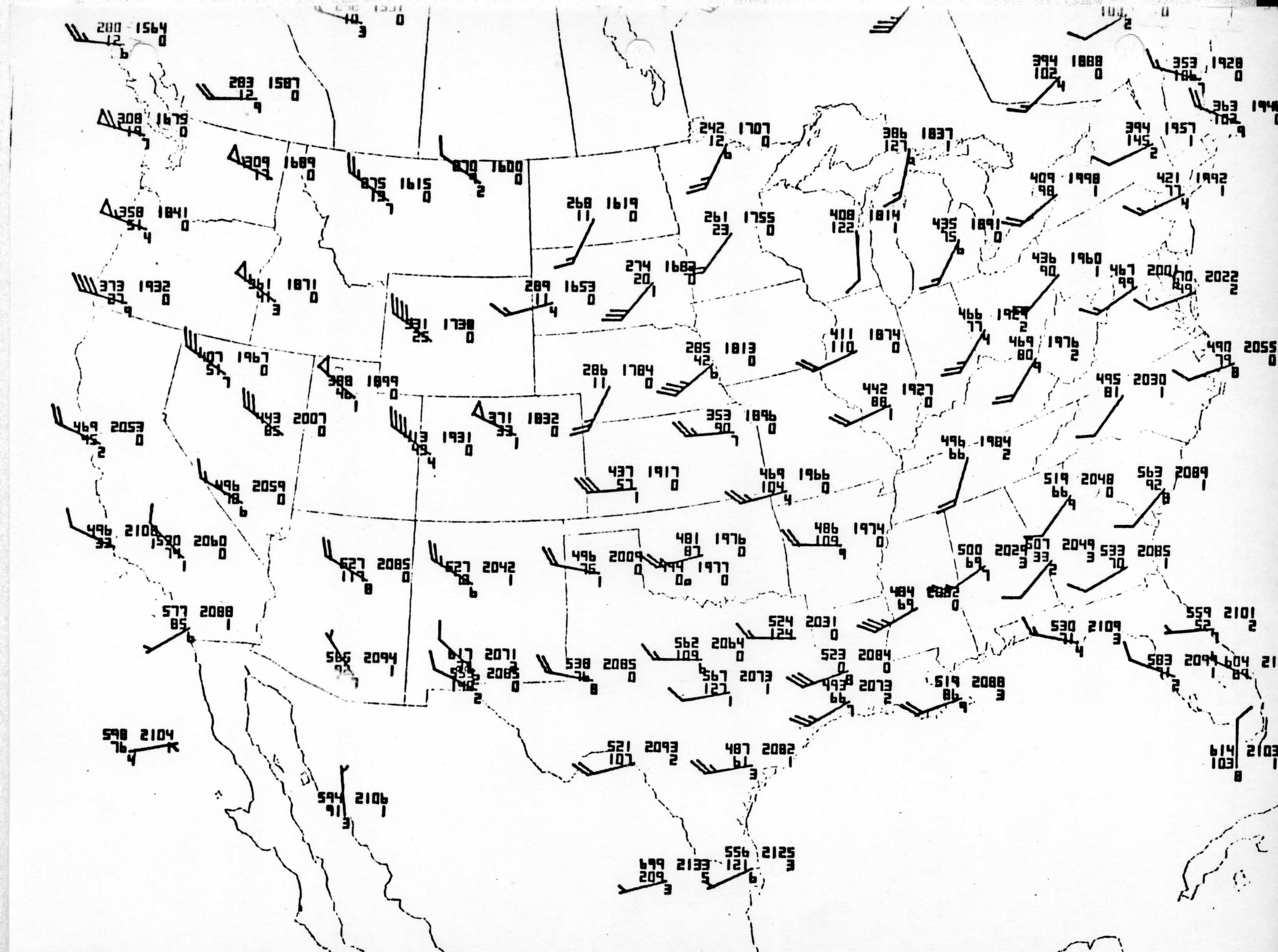

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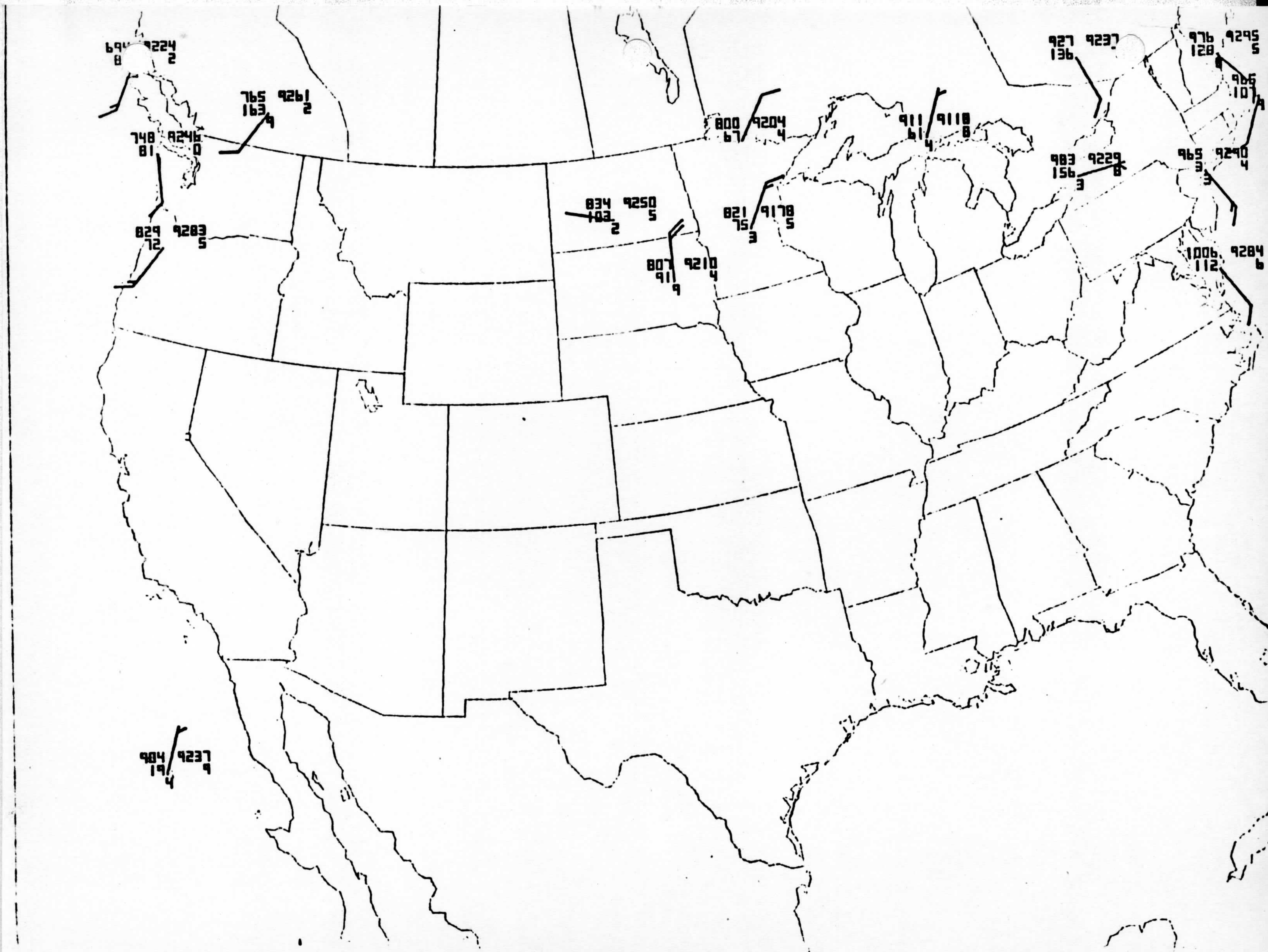

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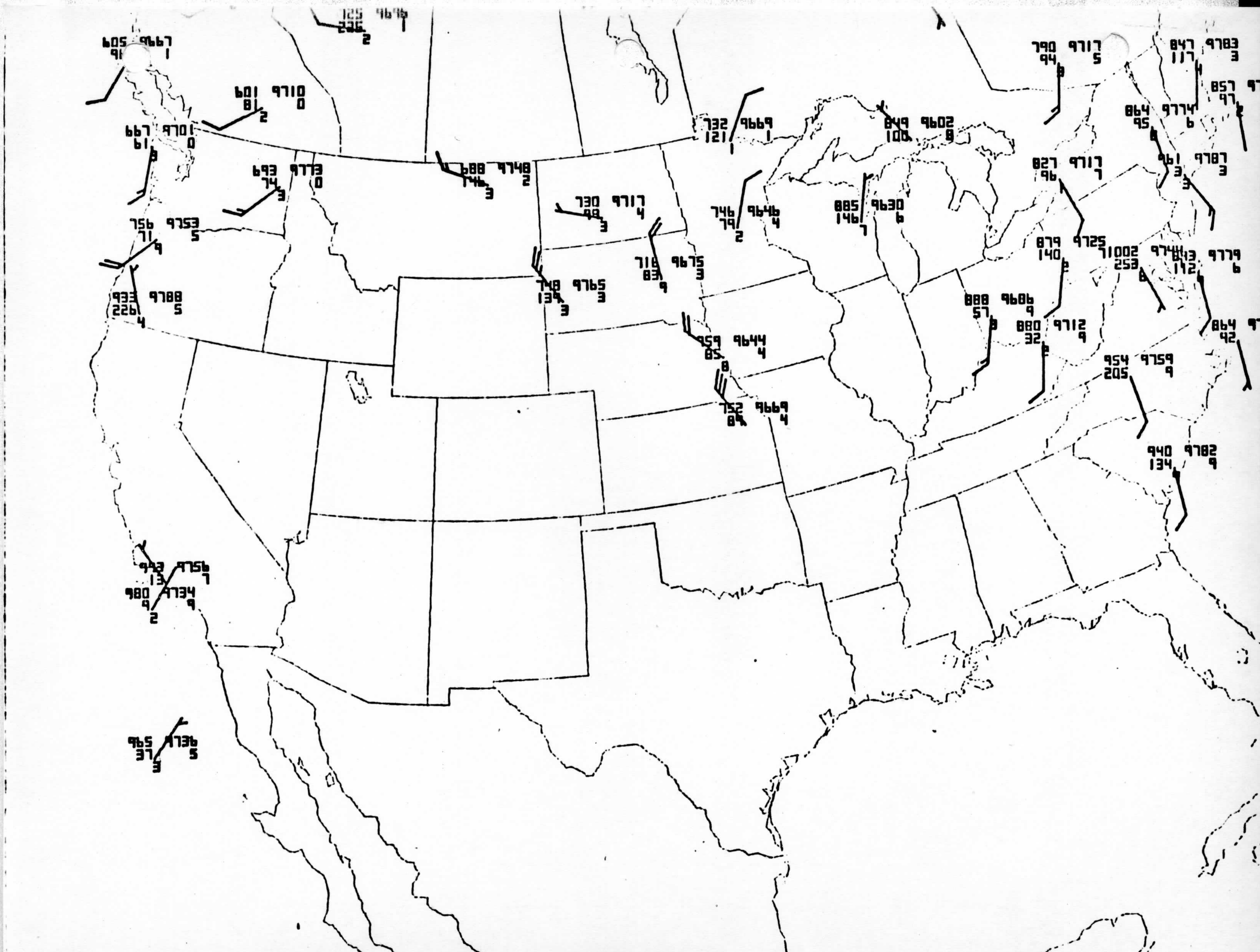

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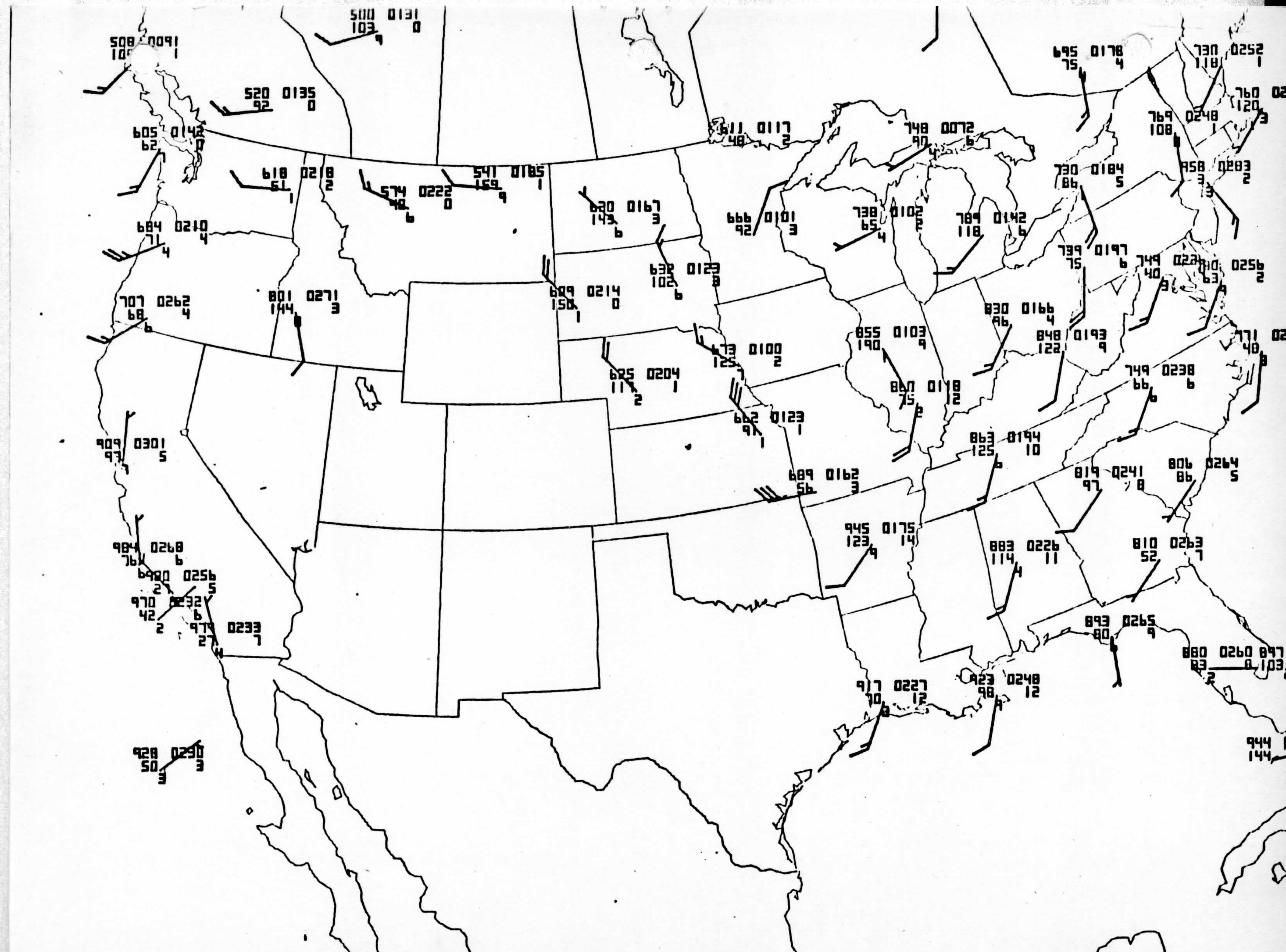

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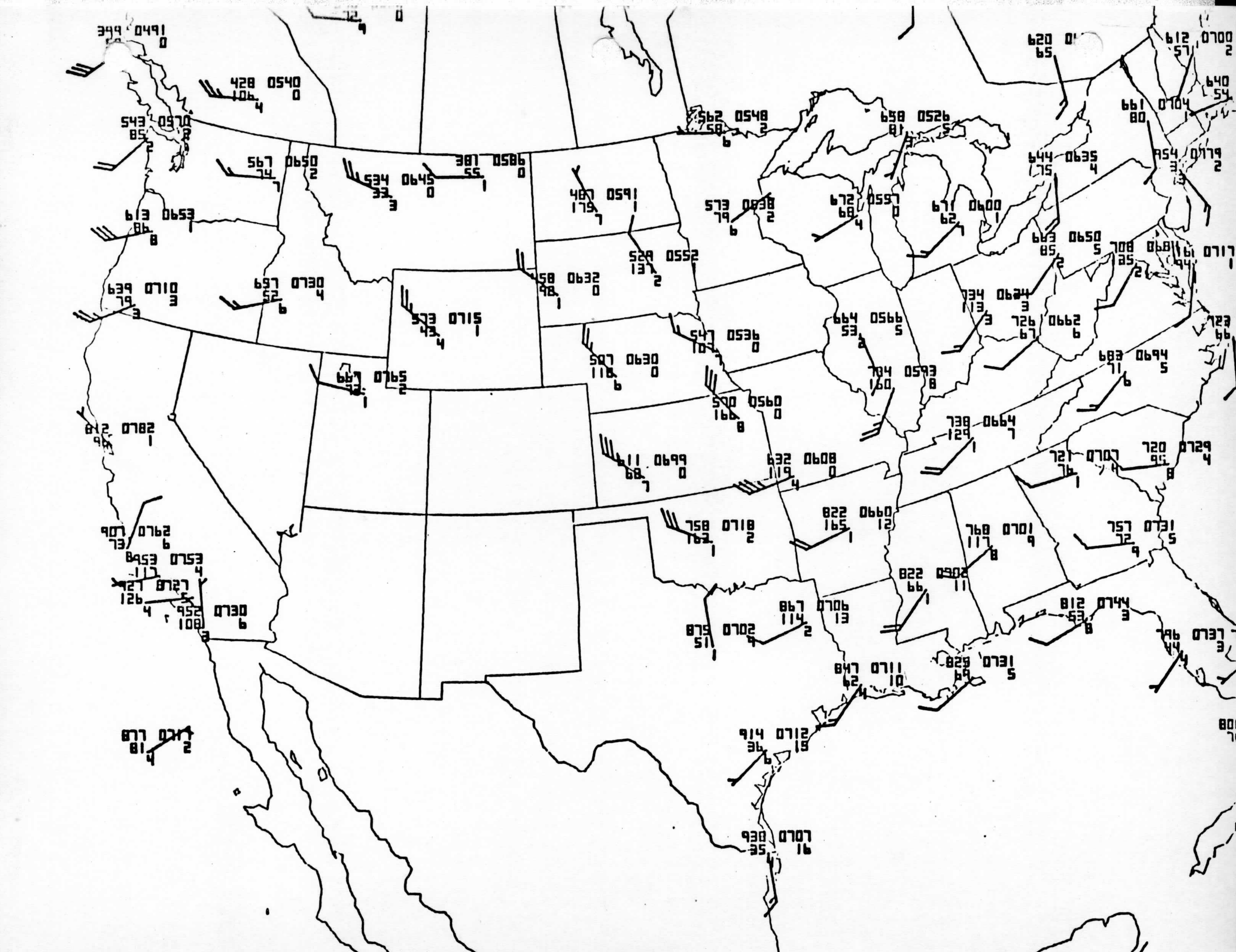

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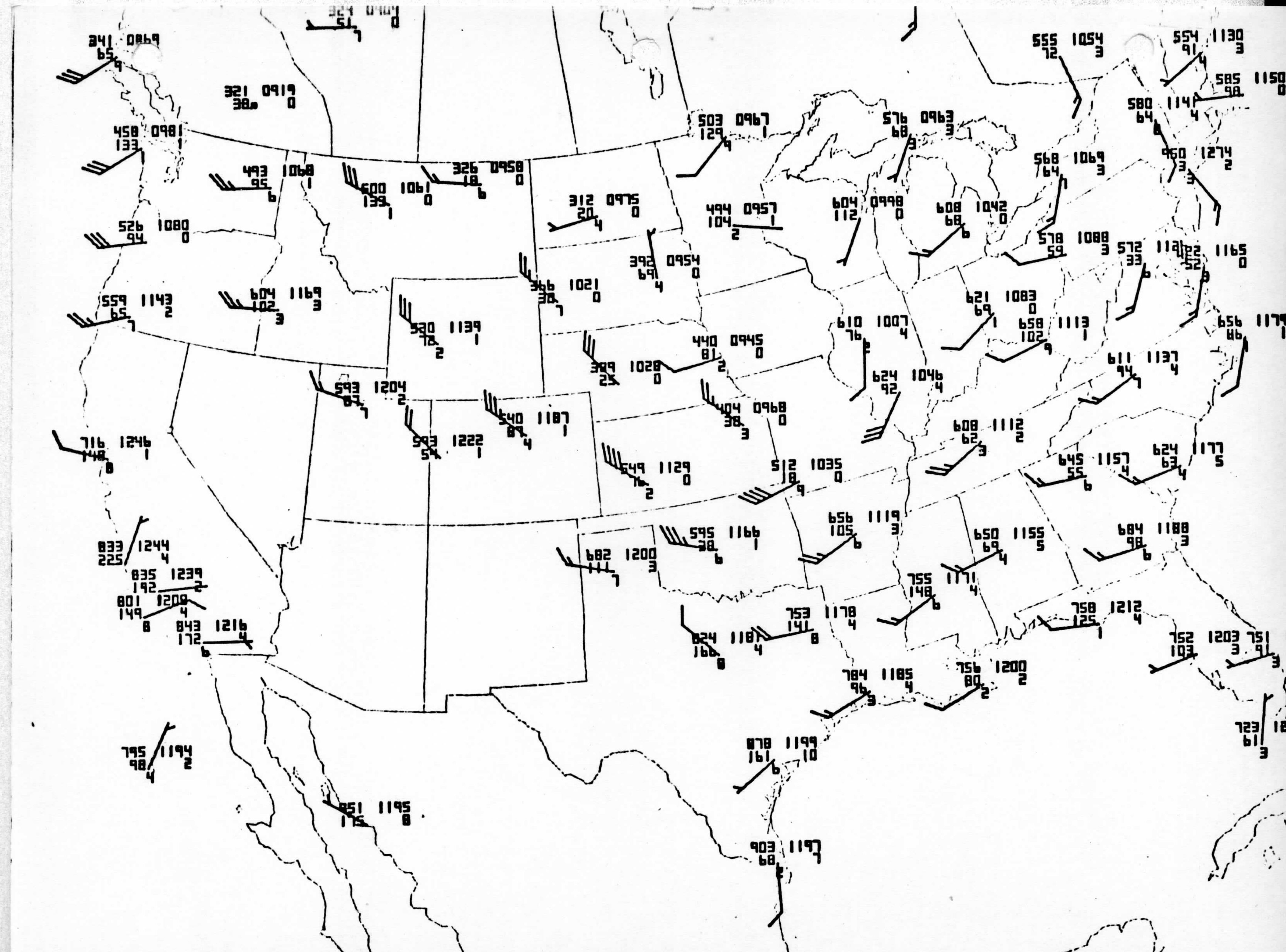

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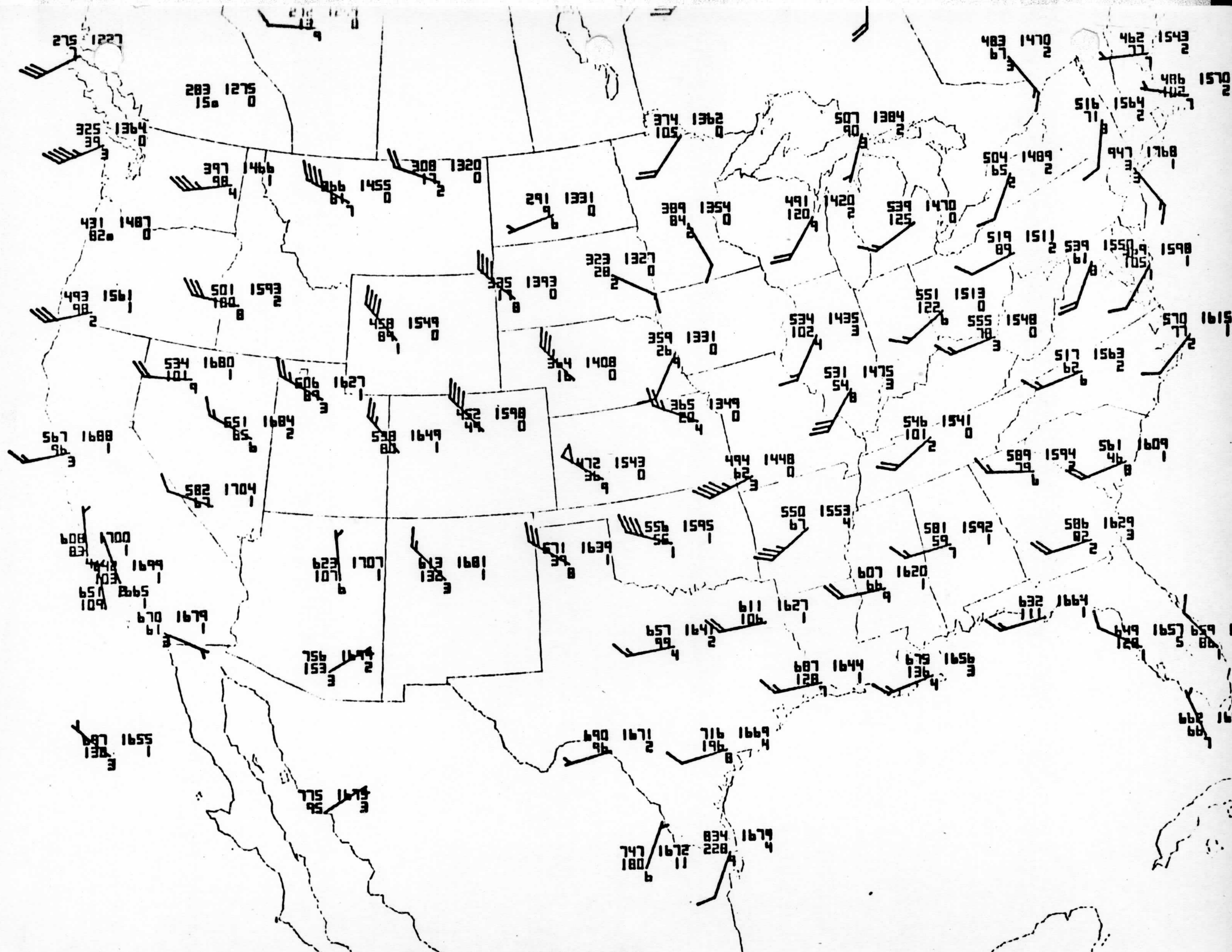

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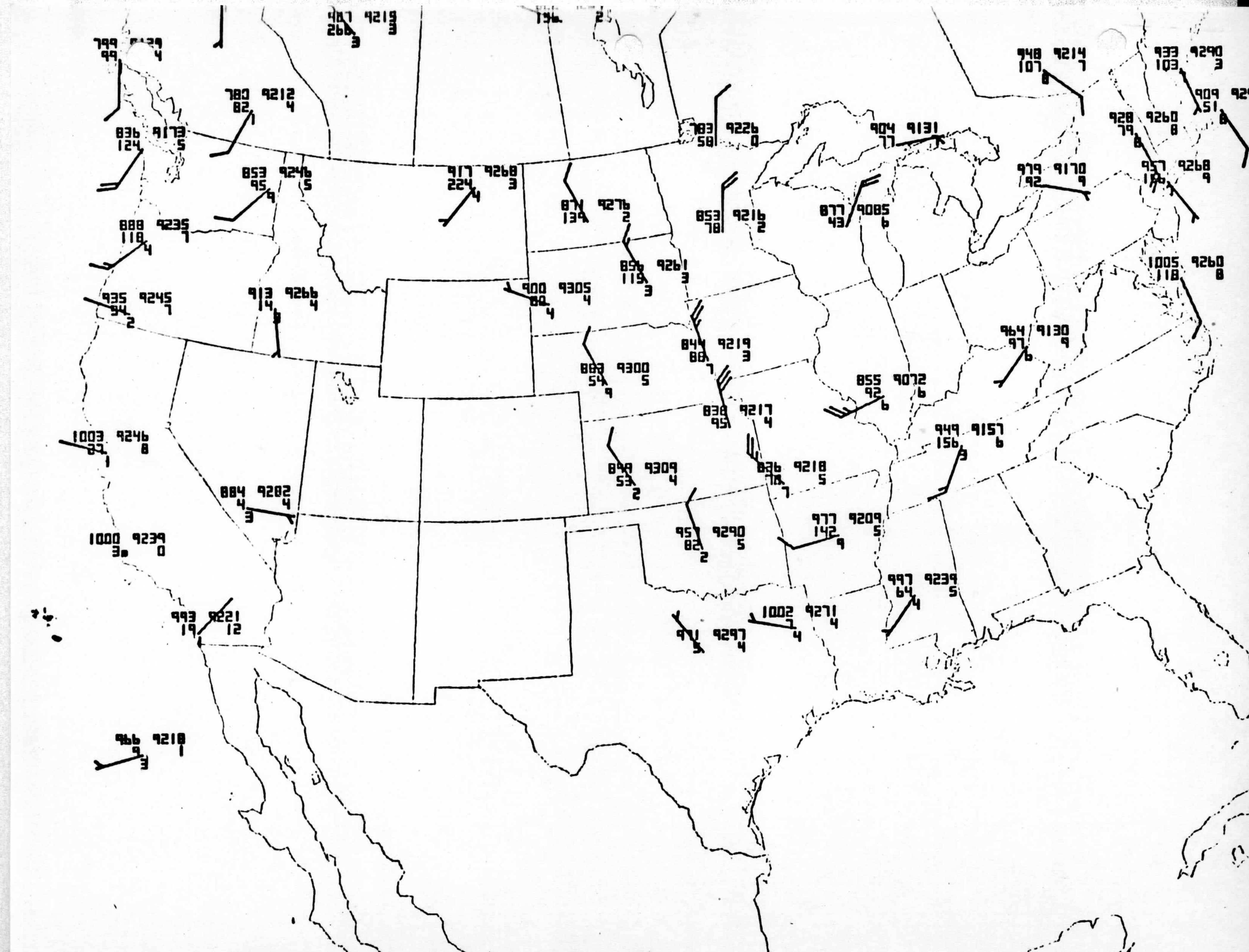

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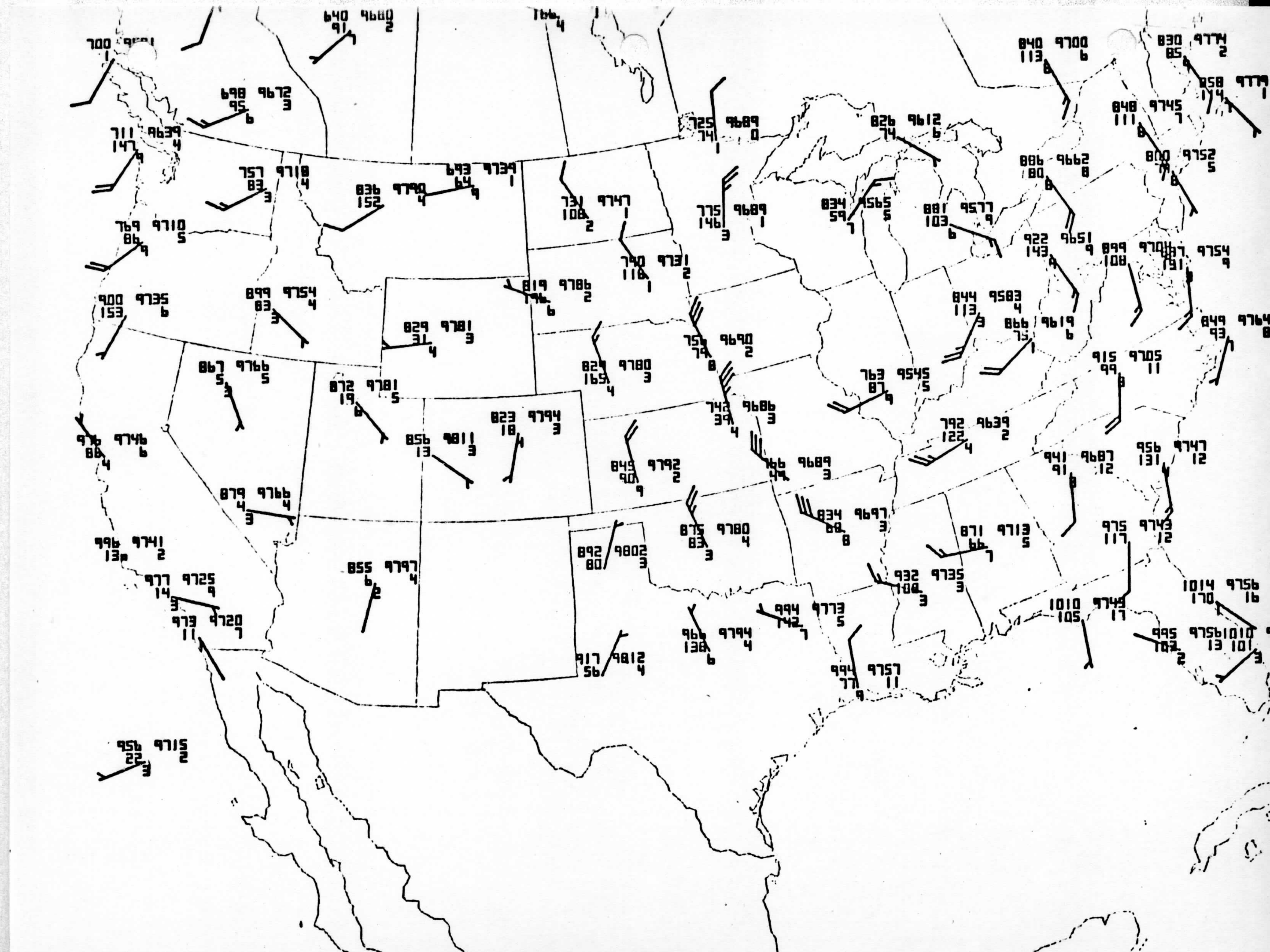

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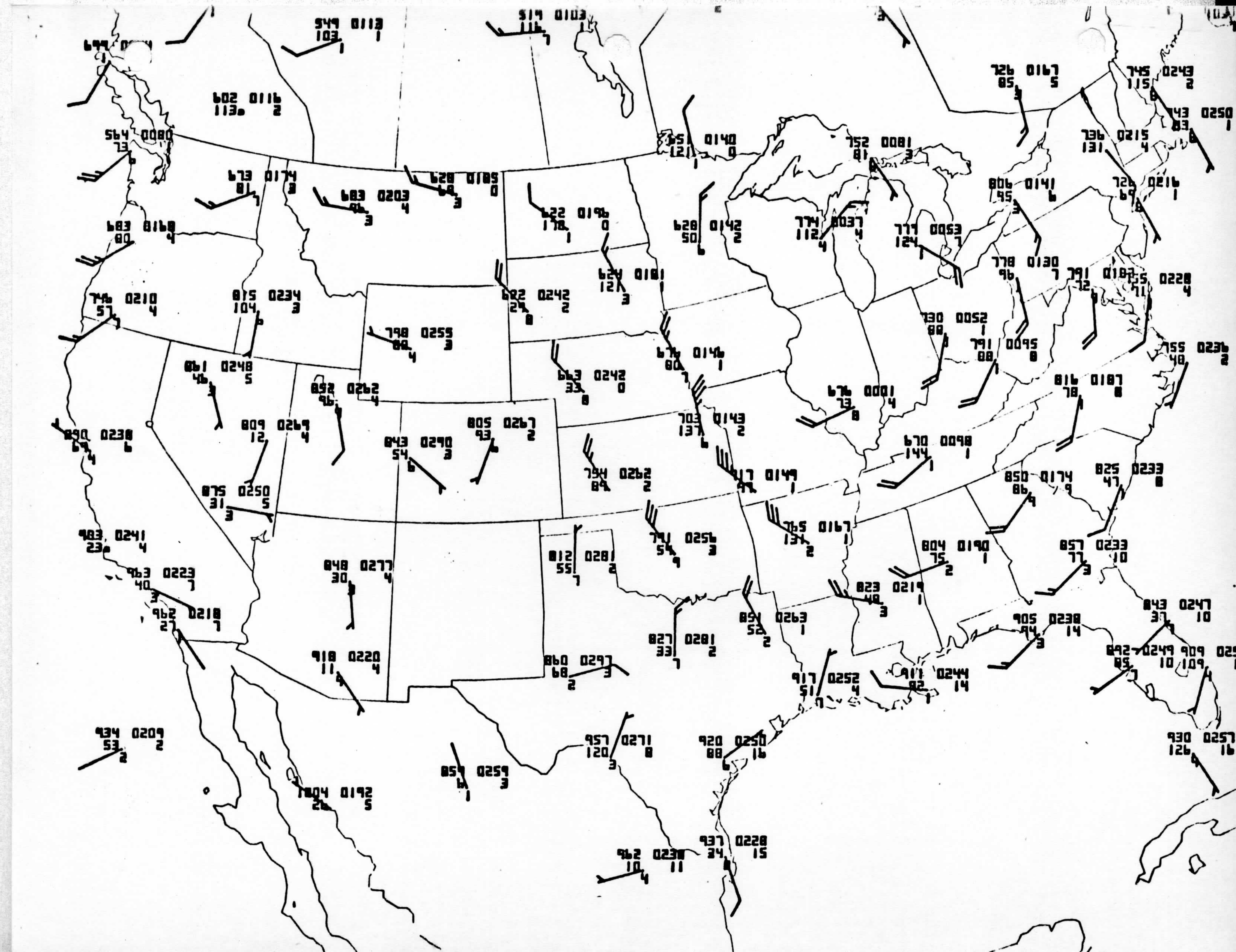

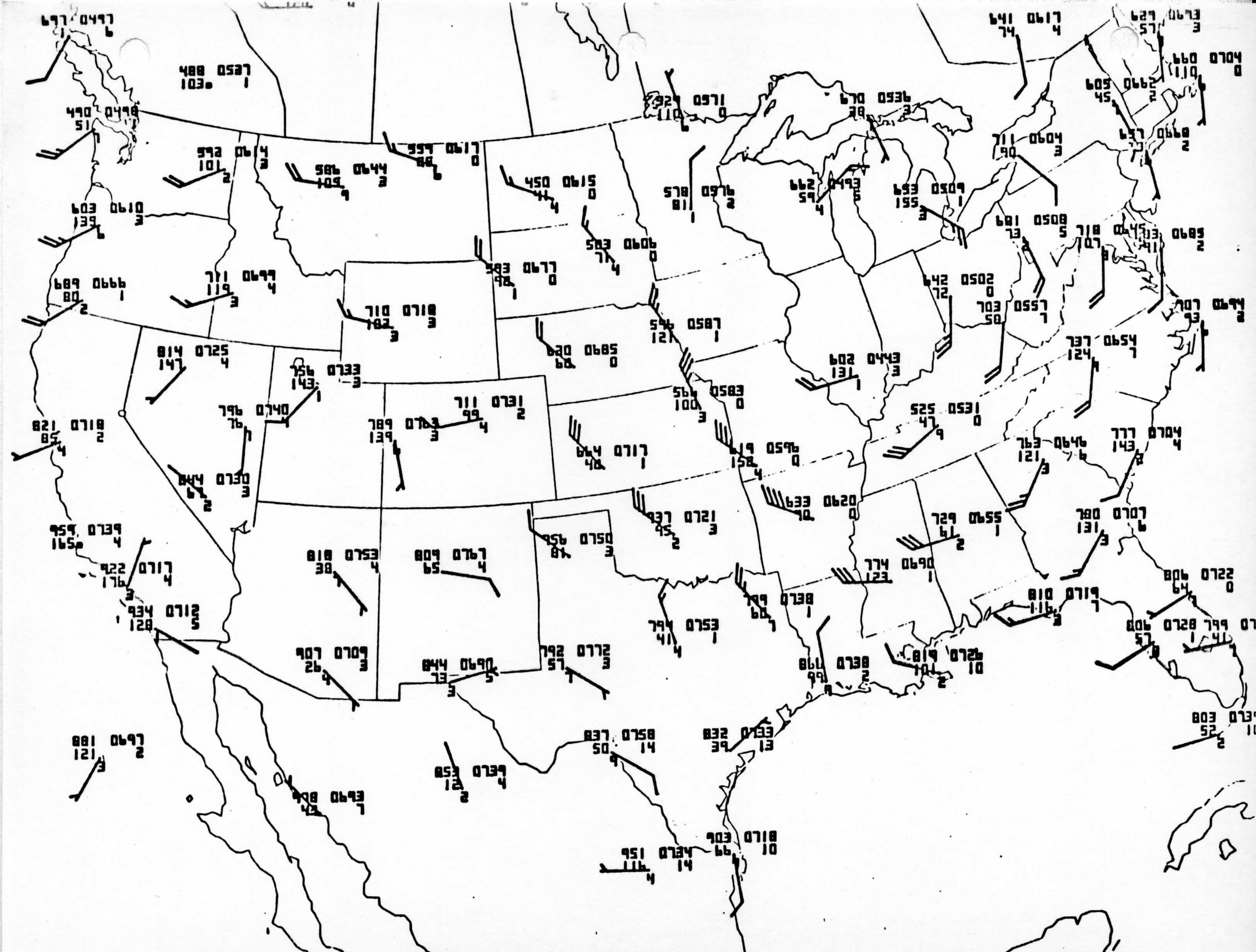

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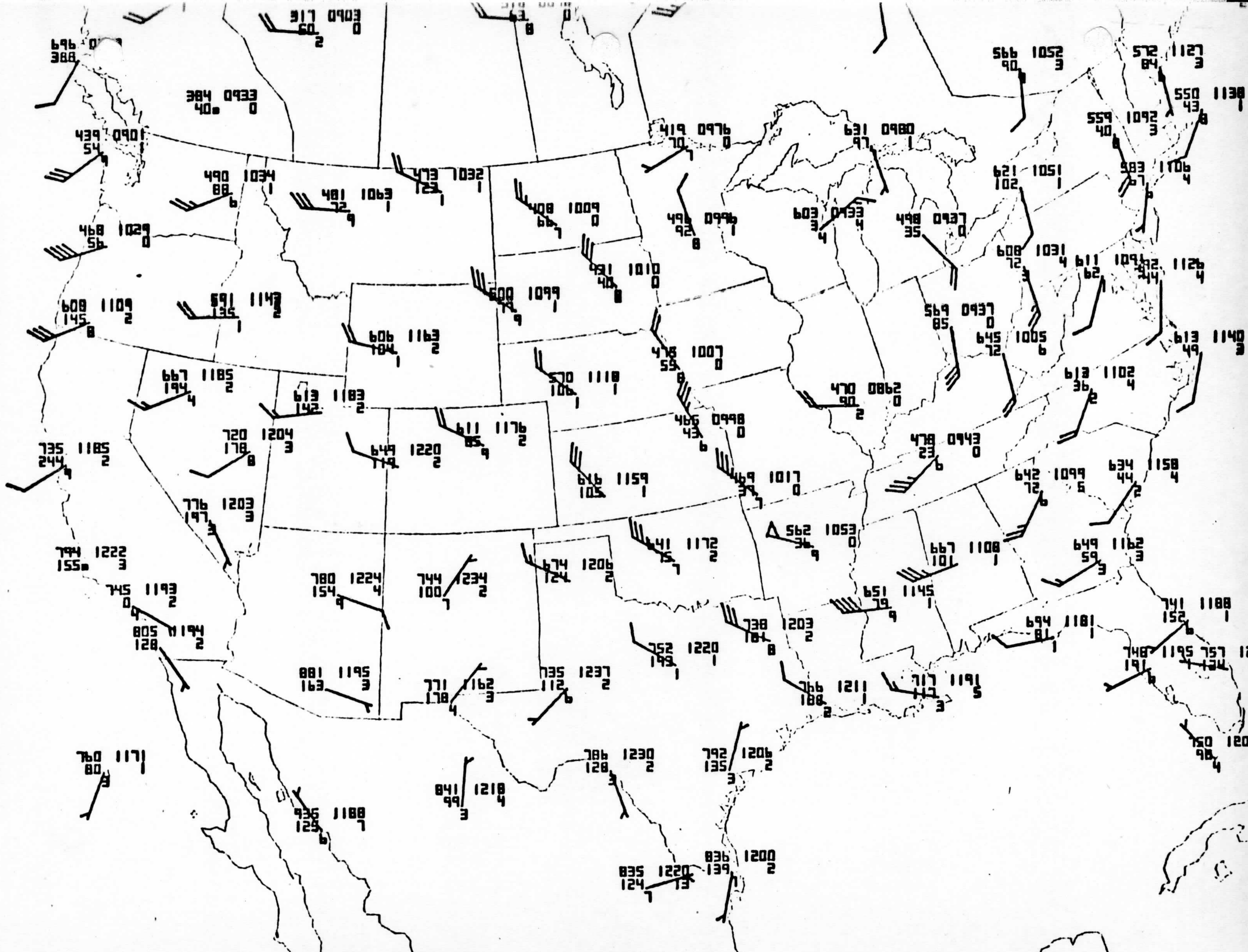
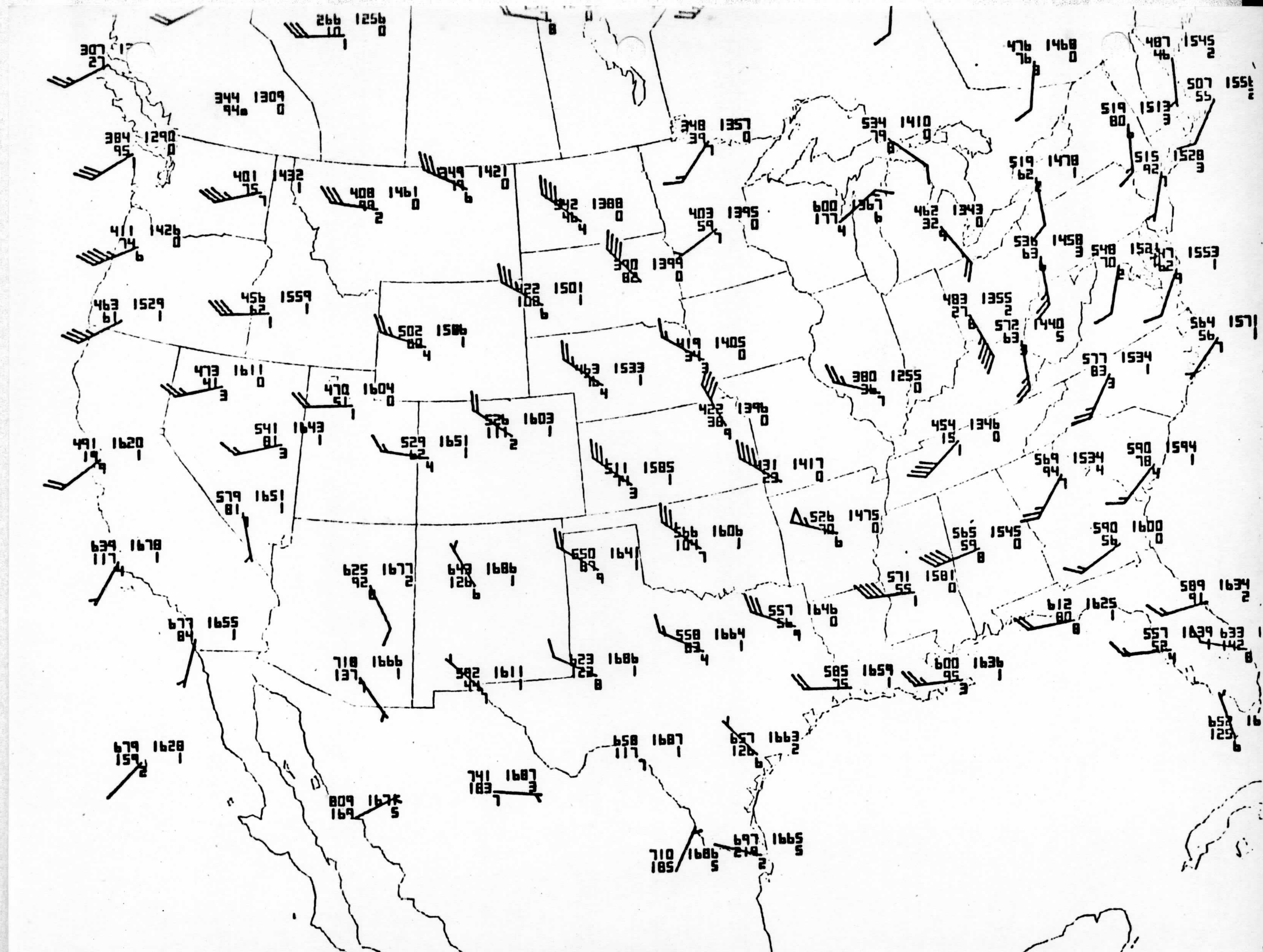


12 MAY 1978



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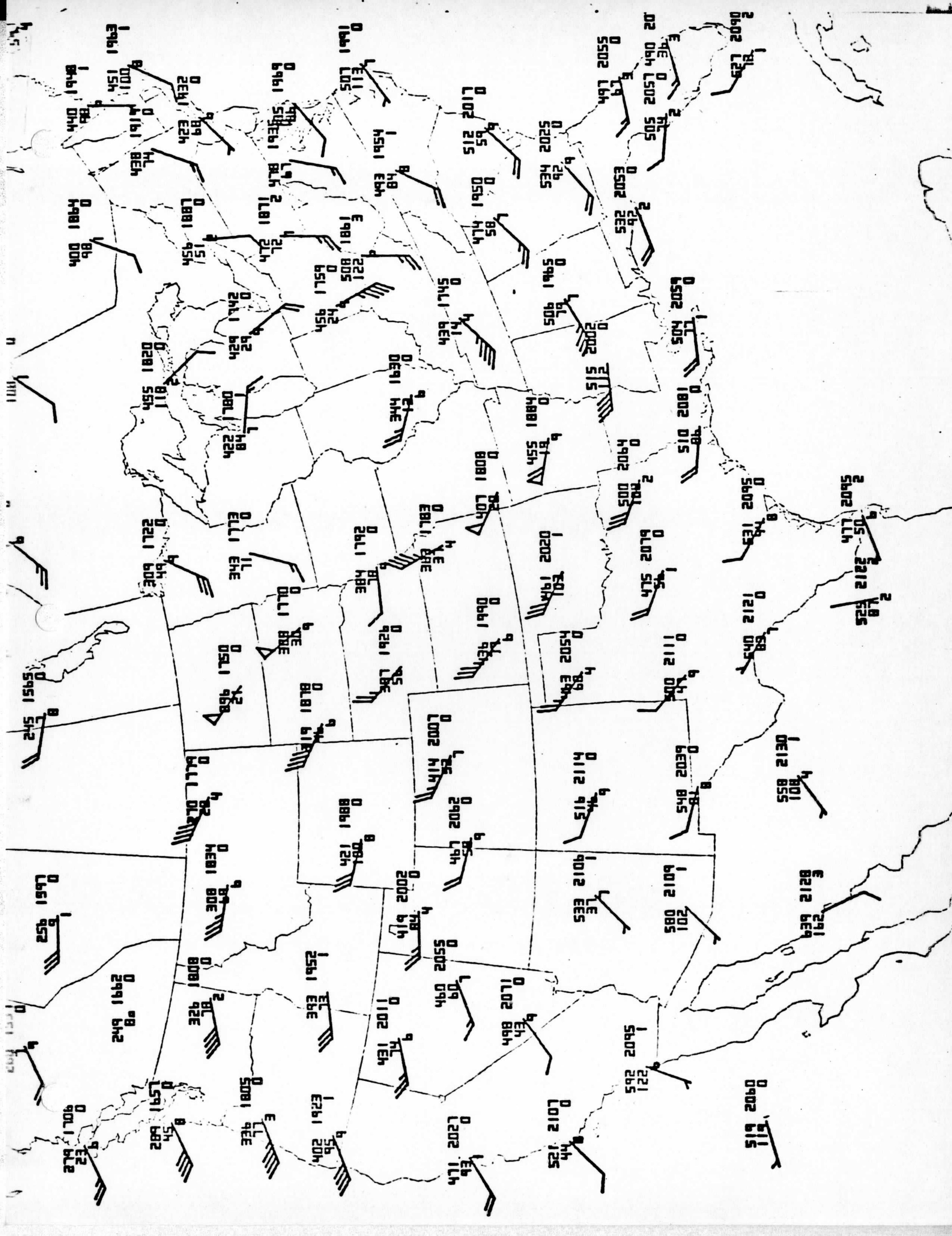

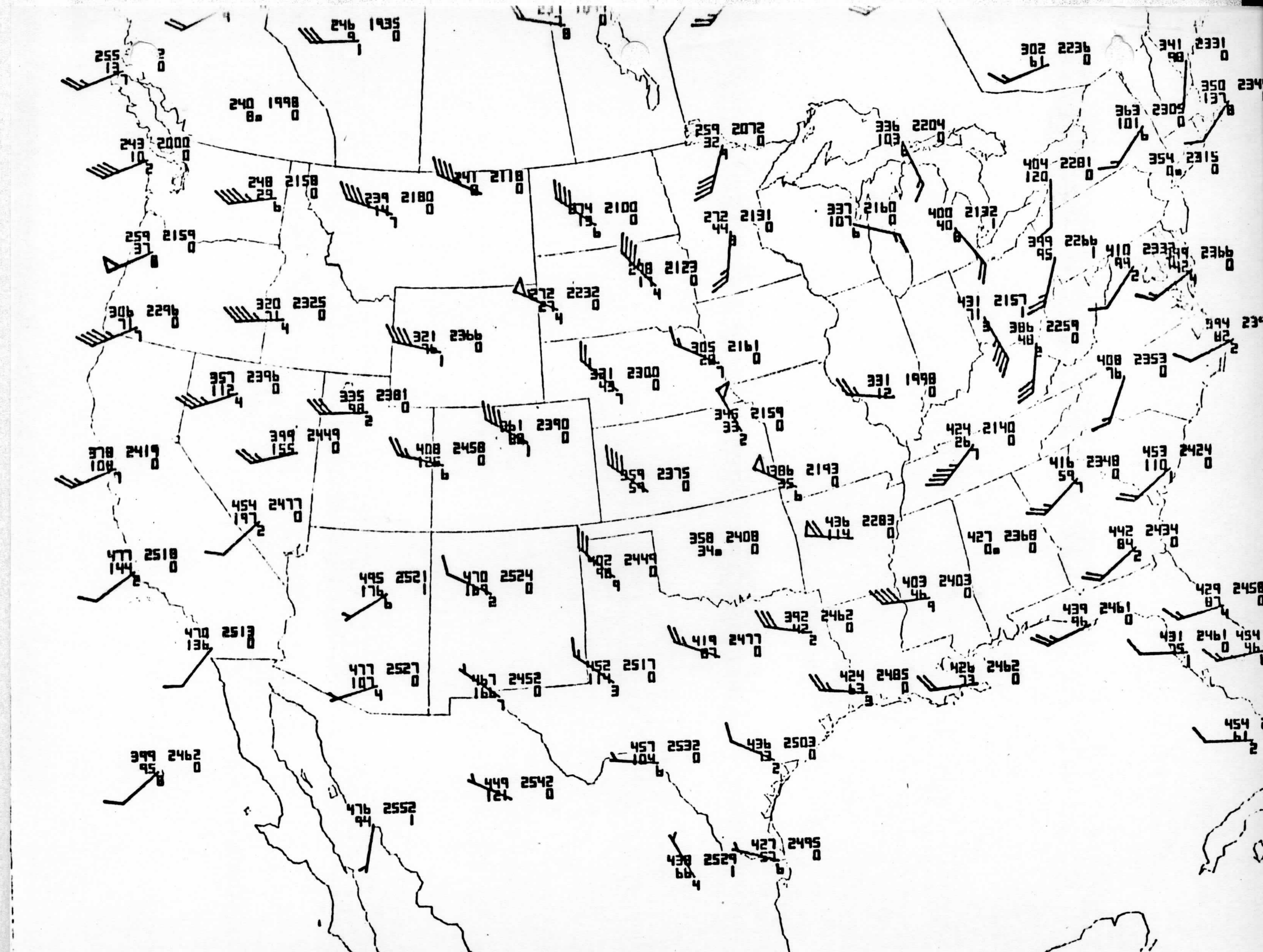

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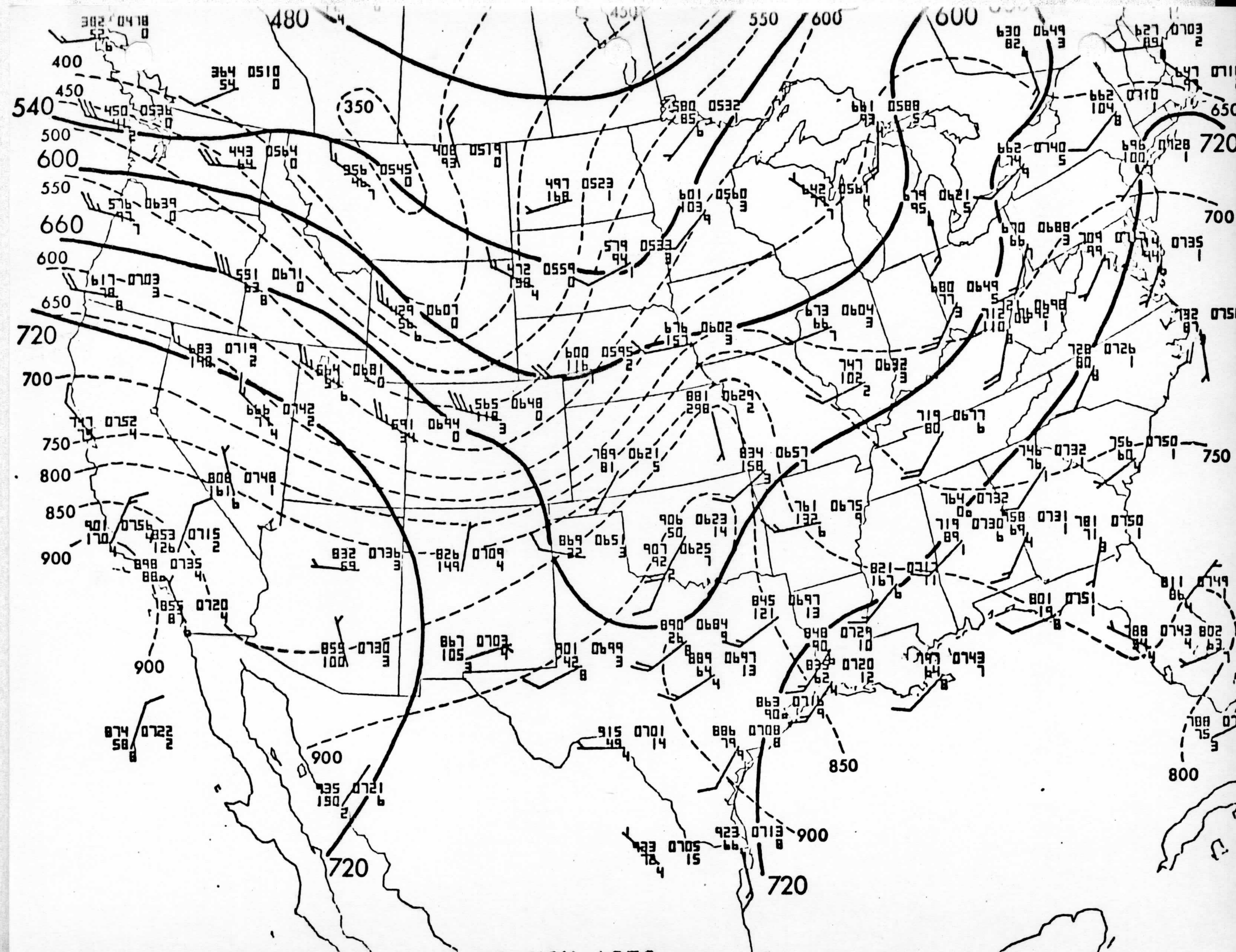

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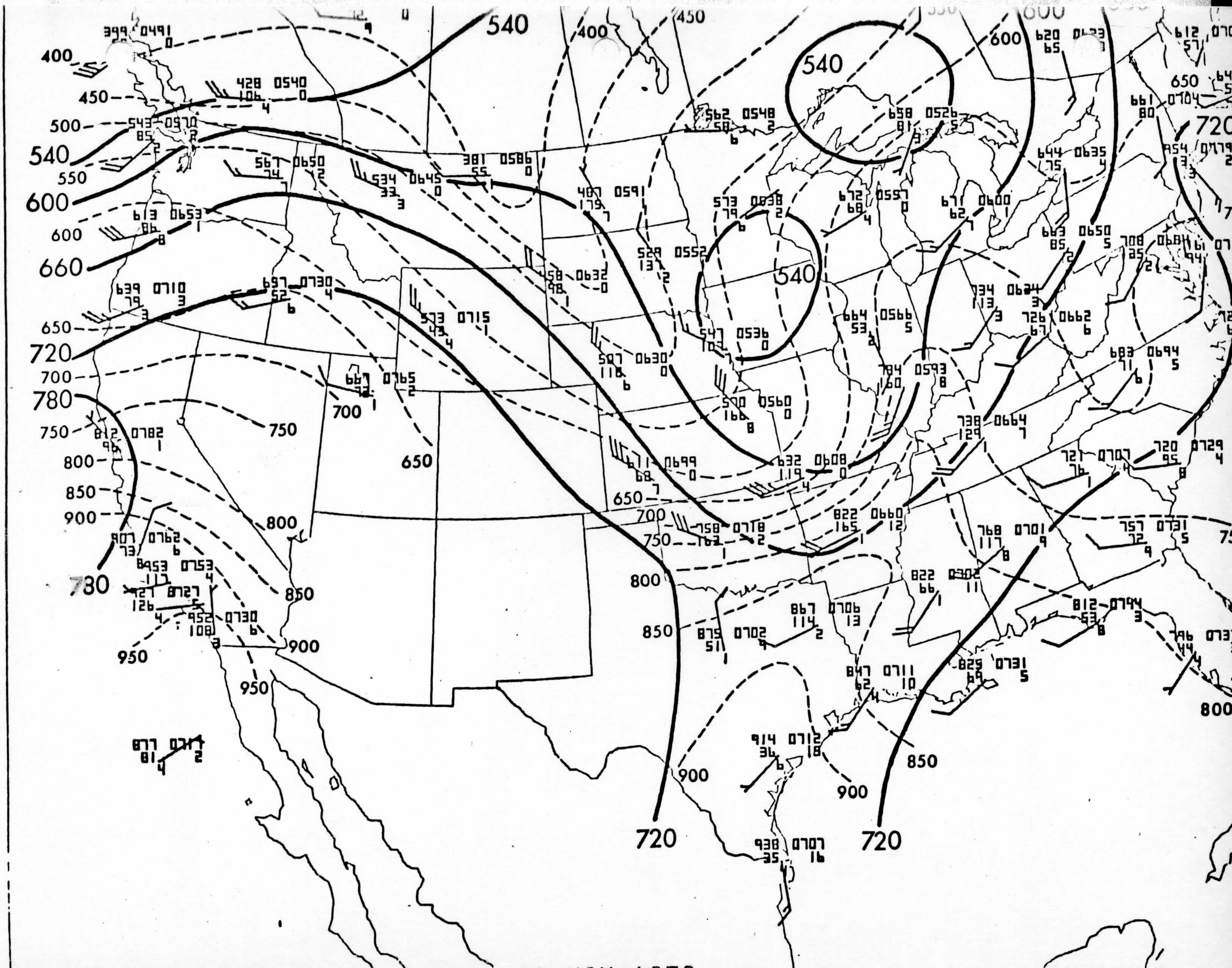
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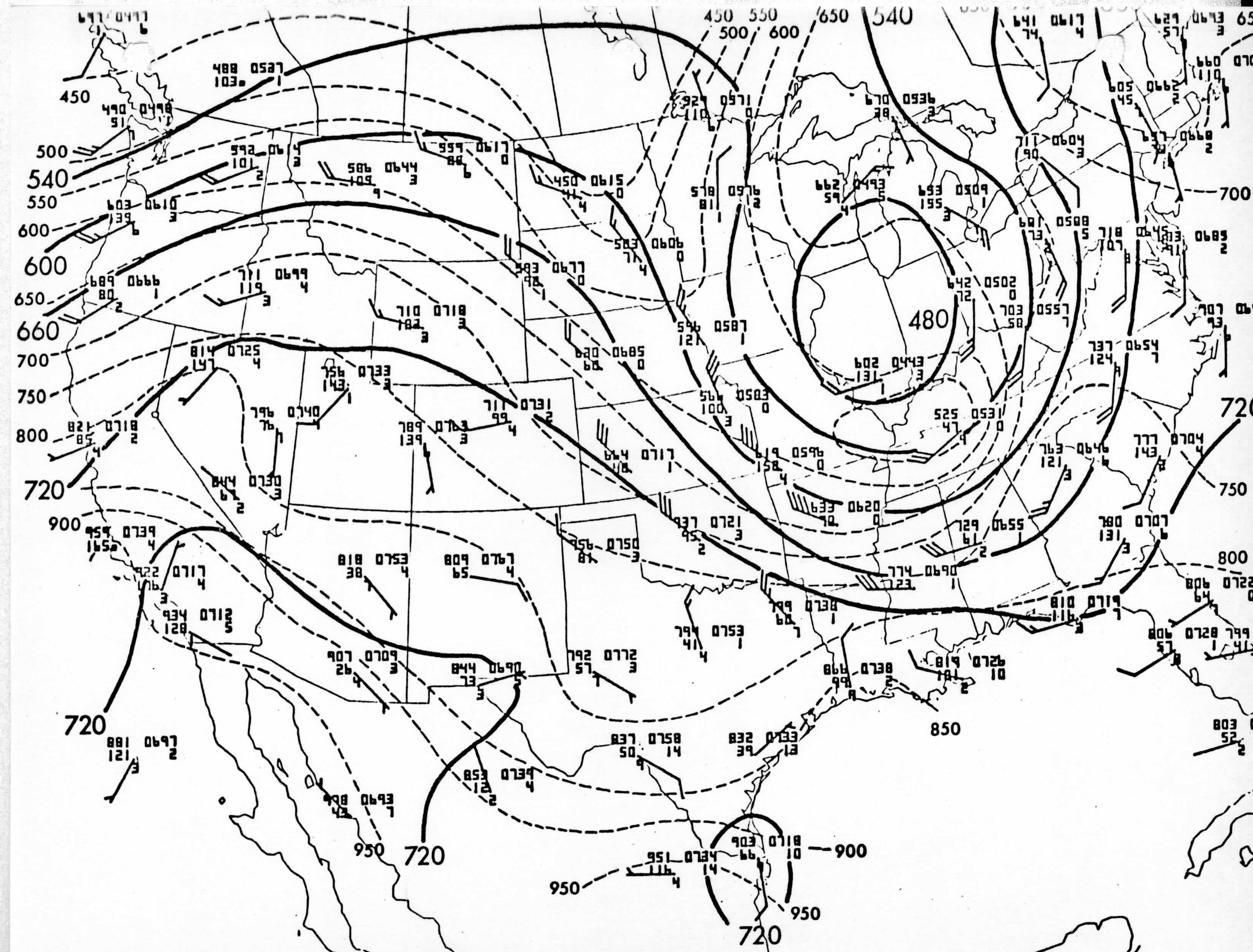
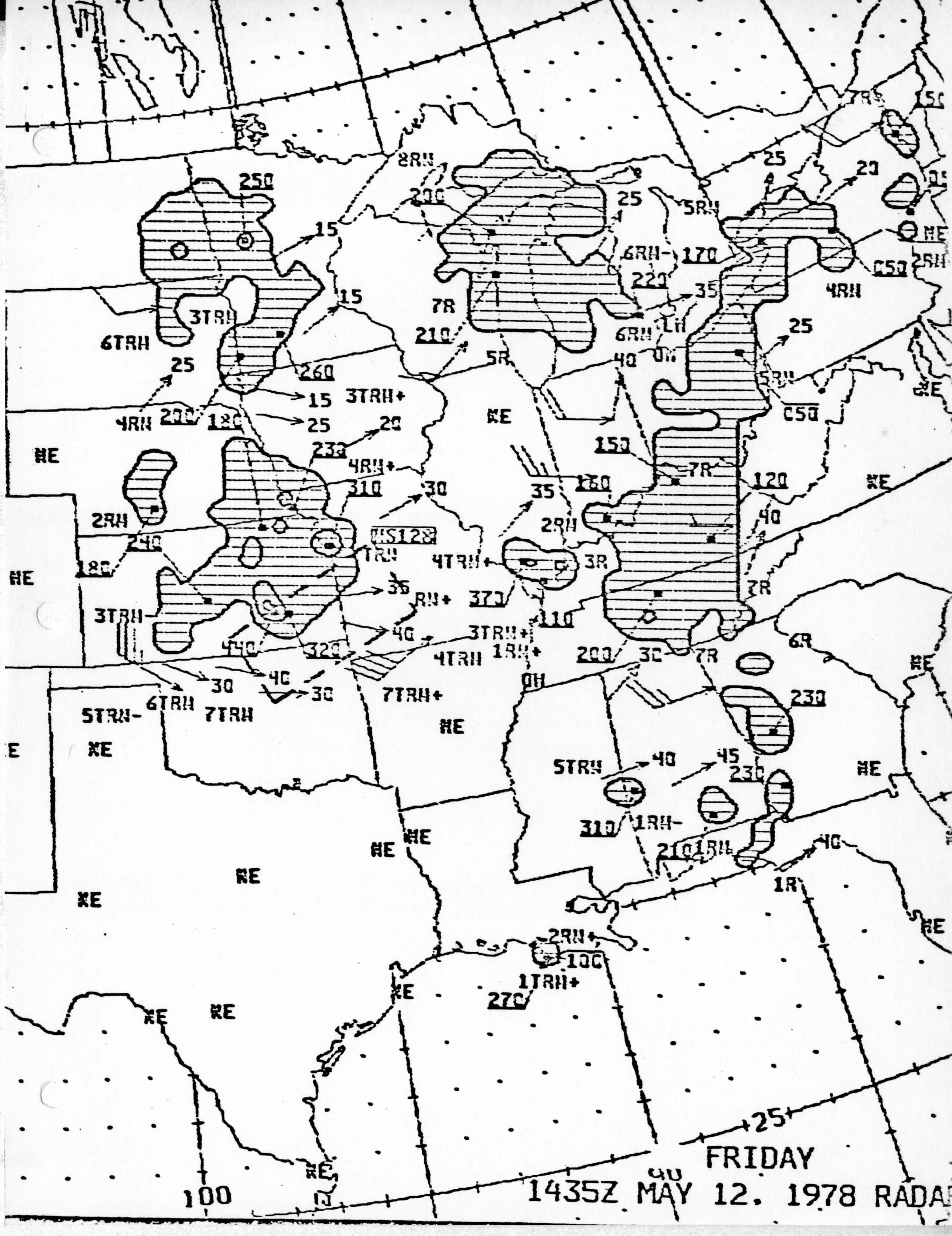


12 MAY 1978

D. RADAR CHARTS



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370
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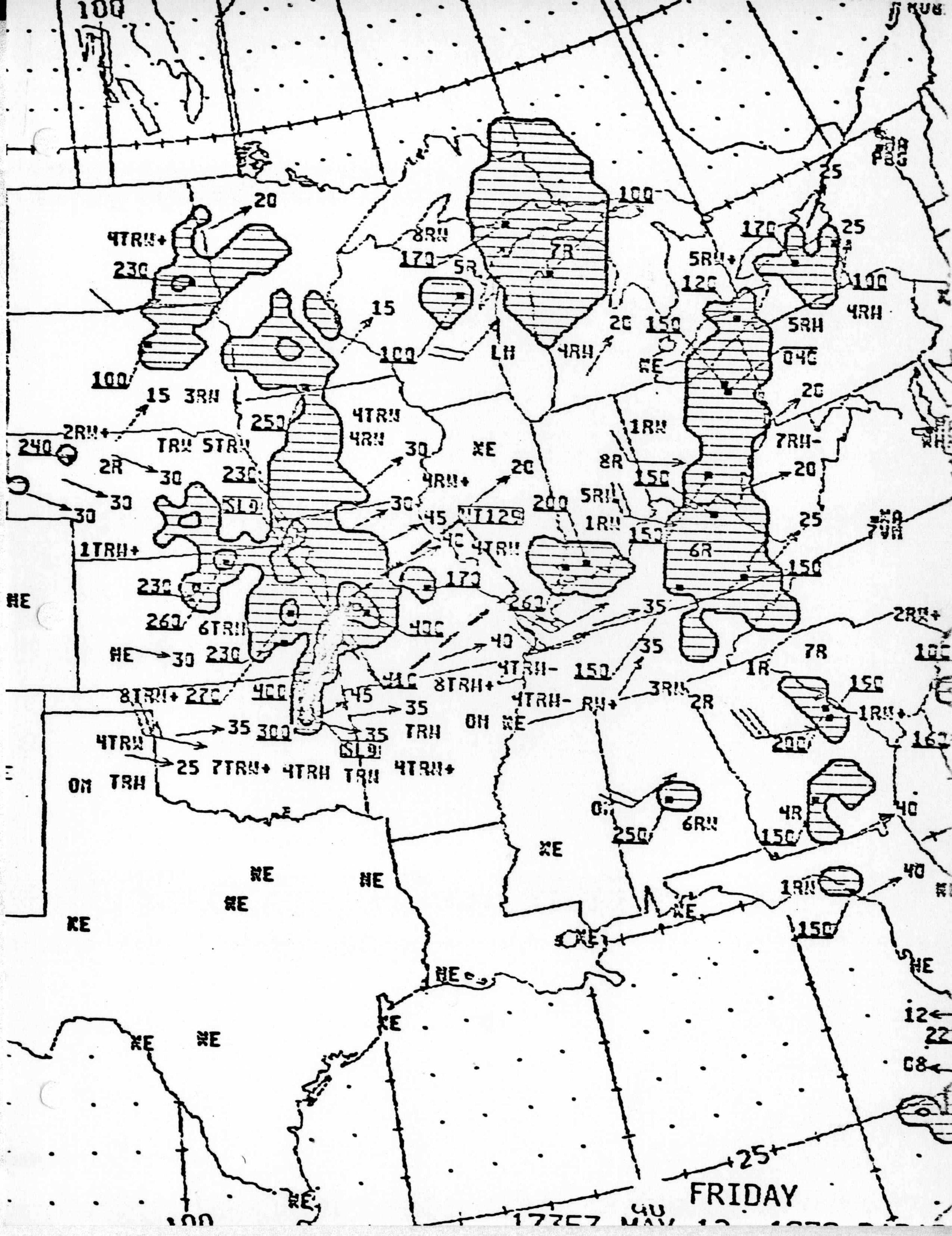
1435Z MAY 12. 1978 RADAR



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5R
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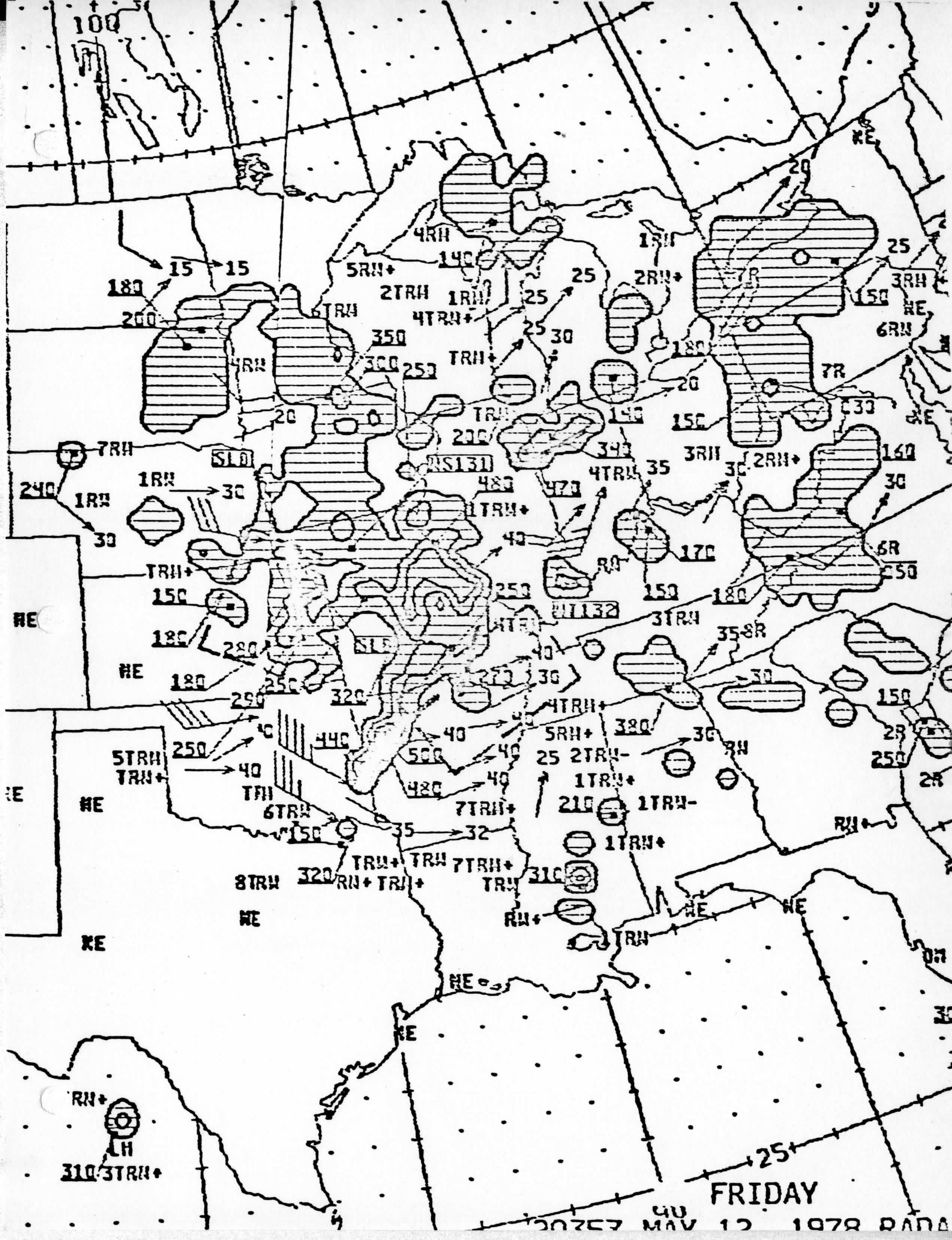

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7RW
SLD
RS131
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3RW
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2RW+
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1RW
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1TRW+
470
4TRW
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40
RW
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6R
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TRW+
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NE
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7TRW+
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RW+
TRW+
8TRW
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RW+
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3TRW+
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FRIDAY
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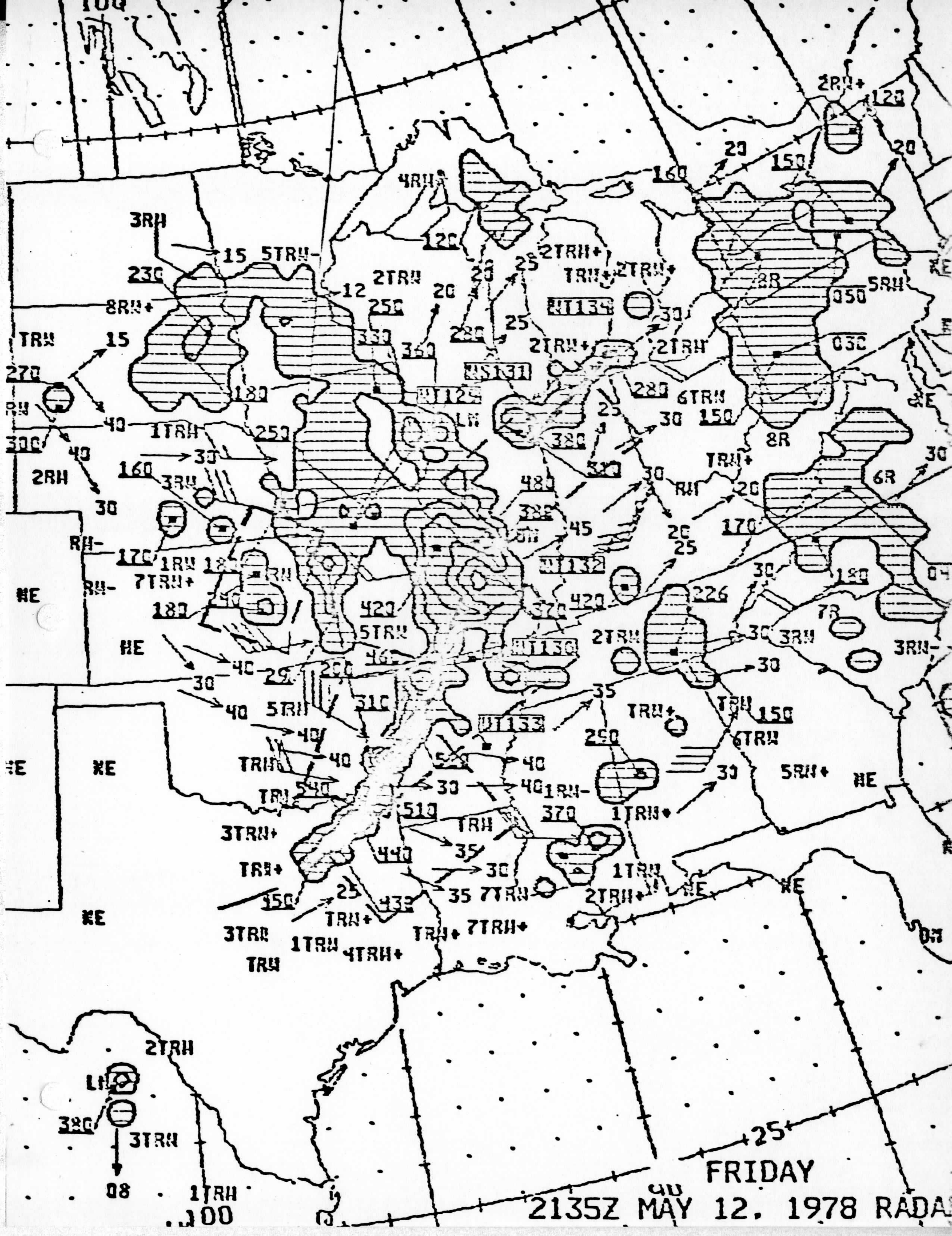
2035Z MAY 12 1978 RADAR



FRIDAY
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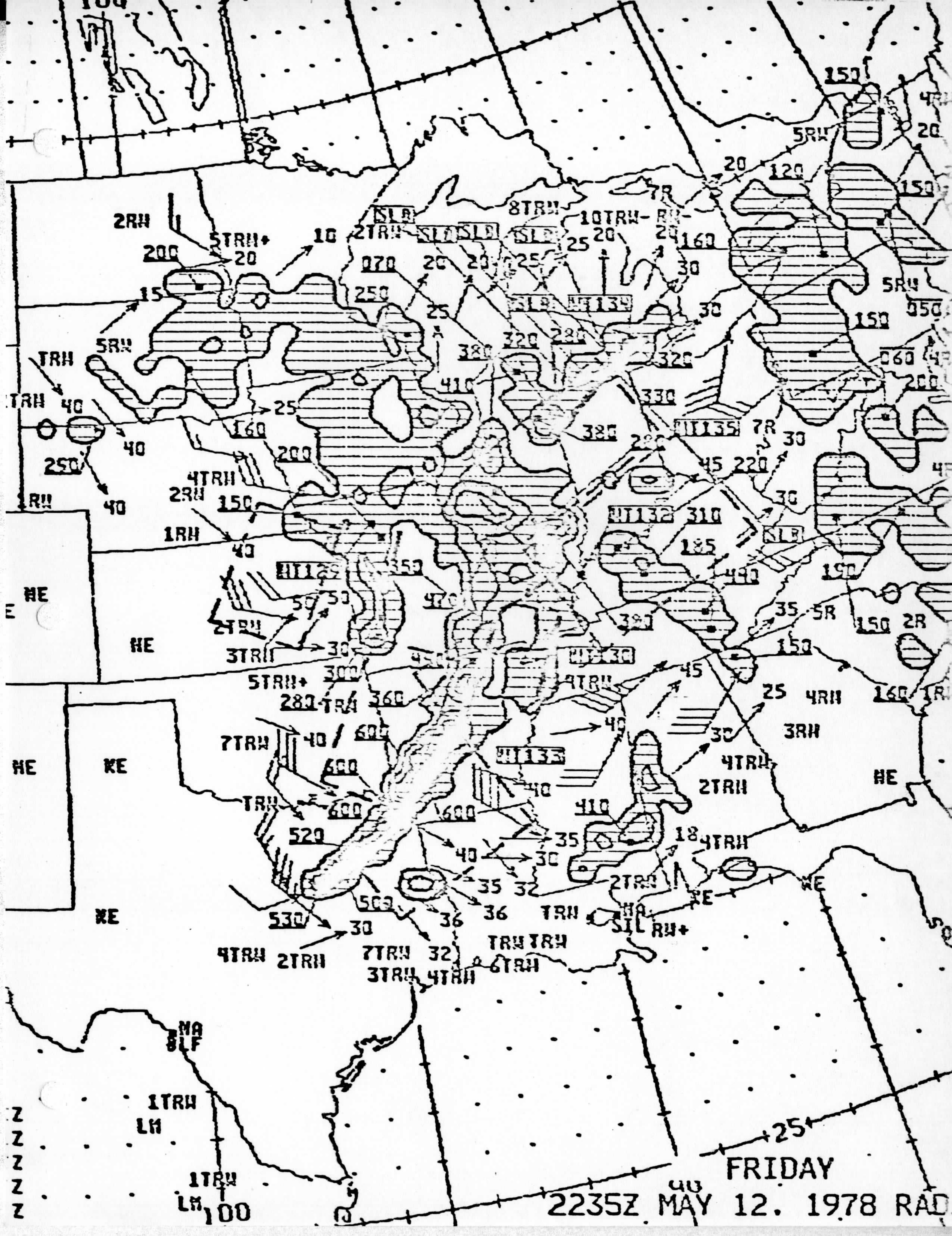
FRIDAY
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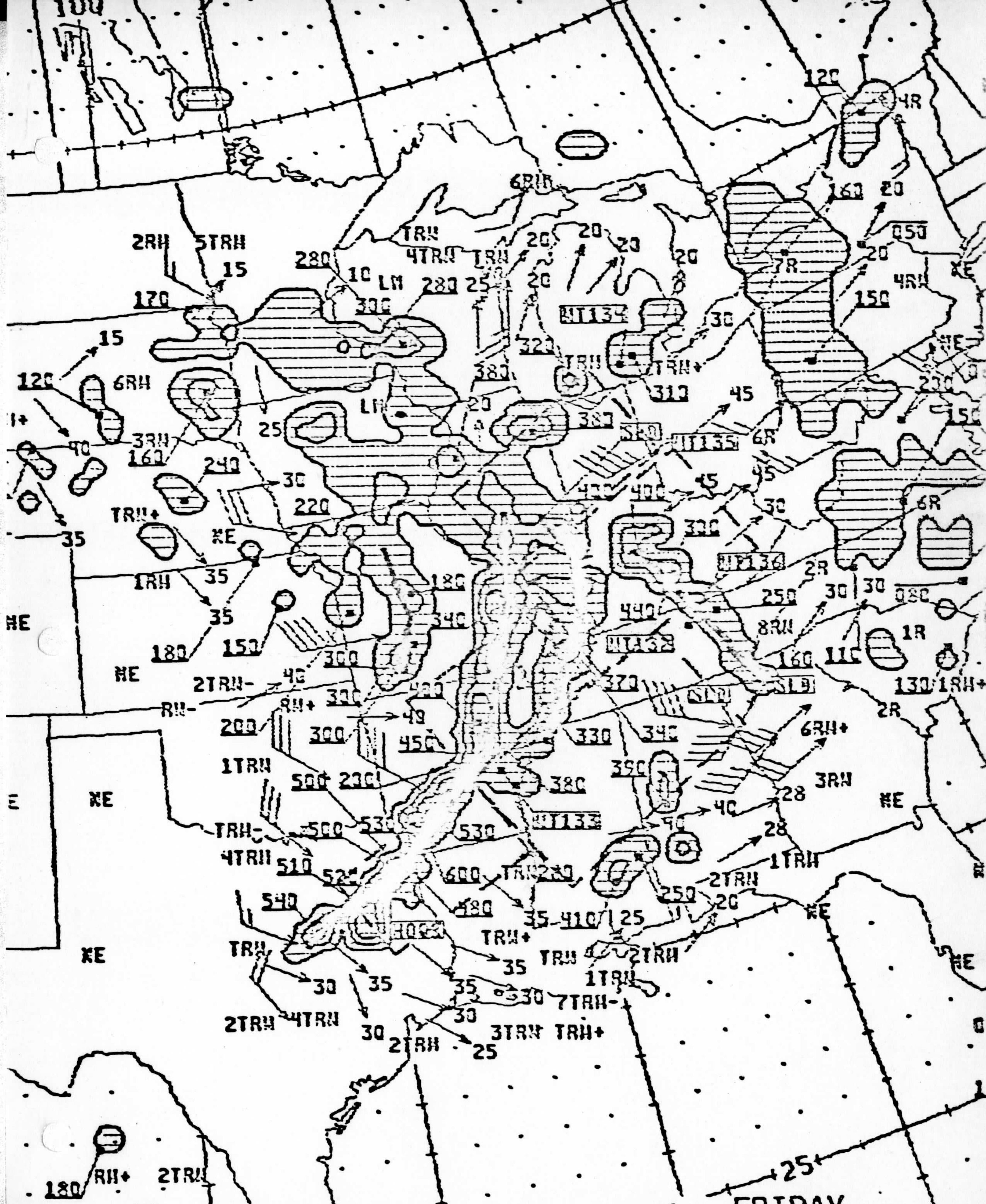

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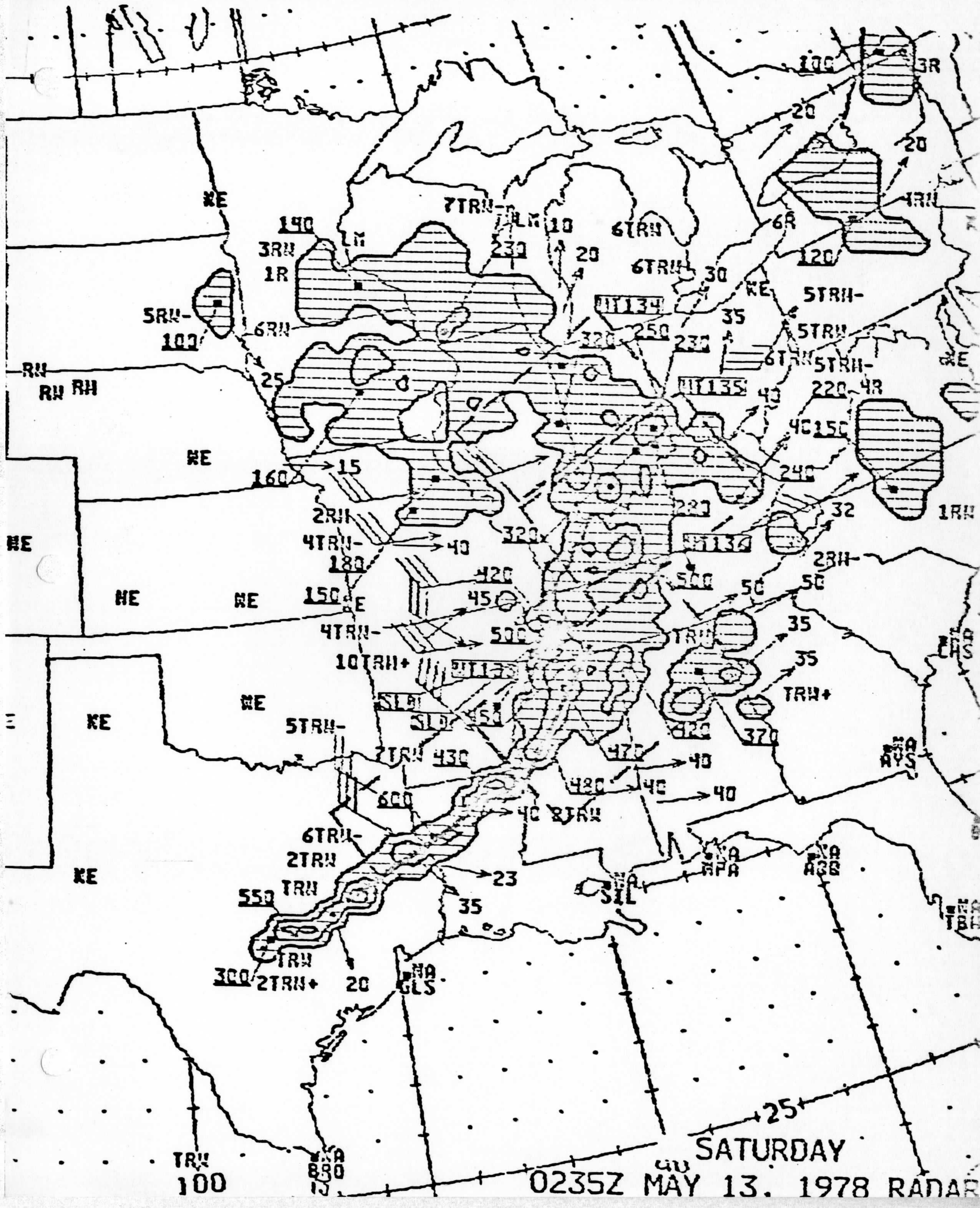

SATURDAY
0235Z MAY 13, 1978 RADAR

APPENDIX B

VIDEO TAPE EVALUATION

VIDEOTAPE QUESTIONNAIRE

Instructions:

This evaluation is intended to judge the effectiveness of the videotape as a teaching tool for synoptic lab instruction. Your answers to the following questions, and any additional comments you may have, will help to determine if the videotape meets this goal or if changes are necessary. When answering the following questions, please write a short response in the space provided below the question. Please write legibly.

Thank you.

1) Do you feel that the videotape presents the material in a logical manner?

2) Is the pace of the videotape too fast or too slow?

3) Were the satellite images and derived fields shown long enough for you to pick out the important features?

4) If given a choice, should the videotape proceed through the various scenes rapidly with the option of reviewing certain features later, or should the scenes change at a much slower pace?

5) Was the visual quality of the videotape acceptable? If not, what areas could be improved?

6) Did the voice narration add or detract from the visual presentation?

7) Are there any synoptic fields or features that should be added to the videotape?

8) Are there any aspects of the videotape that could be deleted?

9) Was the videotape of any educational value to you?

10) If you were teaching synoptic lab, would you use this videotape im your class?

11) Did the videotape help you to visualize the processes that occur in the atmosphere for the synoptic situation examined?

12) Any additional comments?

THE RESULTS OF THE VIDEOTAPE QUESTIONNAIRE

There were 17 questionnaires returned. The comments were summarized where the question was answered by a written response.

	Squall Line Development	Cyclogenesis

1) Do you feel that the videotape presents the material in a logical manner?

	Squall Line Development	Cyclogenesis
YES	12	10
NO	0	0
NO ANSWER	5	7

2) Is the pace of the videotape too fast or too slow?

	Squall Line Development	Cyclogenesis
MUCH TOO FAST	0	0
A LITTLE TOO FAST	9	4
ABOUT RIGHT	6	11
A LITTLE TOO SLOW	1	2
MUCH TOO SLOW	0	0
NO ANSWER	0	0

3) Were the satellite images and derived fields shown long enough for you to pick out the important features? Please check one.

	Squall Line Development	Cyclogenesis
YES	3	4
MOST OF THE TIME	7	9
SOMETIMES	5	4
NO	2	0
NO ANSWER	0	0

If NO or sometimes, what sequences were too brief?

	Squall Line Development	Cyclogenesis
	Upper air maps and soundings too fast.	Upper air streamlines.

	Squall Line Development	Cyclogenesis

4) If given a choice, should the videotape proceed through the various scenes rapidly with the option of playing back certain features later, or should the scenes change at a much slower pace?

	Squall Line Development	Cyclogenesis
QUICK PACE	3	4
SLOWER PACE	10	9
OTHER	3	3
NO ANSWER	1	1

5) Was the visual quality of the videotape acceptable?

If not, what areas could be improved?

	Squall Line Development	Cyclogenesis
YES	11	7
NO	1	2
COMMENT	5	8
NO ANSWER	0	0

Squall Line Development	Cyclogenesis
Numbers are hard to read. Red is very poor color. Green "interval" hard to read.	Isotachs were poor. Poor quality red lines and banding. Numbers hard to read. Better time continuity.

6) Would a written study quide or a voice presentation of the videotape enhance your understanding of the visual presentation?

If yes, which one?

	Squall Line Development	Cyclogenesis
YES	14	8
NO	1	2
COMMENT	1	6
NO ANSWER	1	1

	Squall Line Development	Cyclogenesis
VOICE	13	14
STUDY QUIDE	1	1
PROFESSOR'S NARRATION	1	0

	Squall Line Development	Cyclogenesis

7) Was the videotape of any educational value to you?

If yes, in what way?

	Squall Line Development	Cyclogenesis
YES	15	12
NO	0	1
COMMENT	0	3
NO ANSWER	2	1
	Provide a visual picture of the various fields.	Expands on map analysis. Better sense of how fields were changing with time. Overall view of what is occurring.

8) If you were teaching synoptic lab, would you use this videotape in your class?

	Squall Line Development	Cyclogenesis
YES	15	11
MAYBE	2	4
NO	0	1
NO ANSWER	0	0

9) Did the videotape help you to visualize the processes that occur in the atmosphere for the synoptic situation examined?

If yes, in what way?

	Squall Line Development	Cyclogenesis
YES	14	12
NO	0	1
COMMENT	2	2
NO ANSWER	1	2
	Provided overview of how clouds and parameters are related.	Streamlines on banded fields. Overall picture.

	Squall Line Development	Cyclogenesis

10) What sequences do you think were the most significant during the videotape in capturing or illustrating the synoptic event that occurred?

Squall Line Development	Cyclogenesis
Satellite loop. Loop of surface parameters.	Streamline fields (upper & lower). Satellite loop.

11) Are there any synoptic fields or features that should be added to the videotape?

Squall Line Development	Cyclogenesis
300 mb isotachs. Cross section. 850 mb heights.	Vorticity advection. Radar. Pressure falls.

12) Are there any aspects of the videotape that were confusing or could be deleted?

Squall Line Development	Cyclogenesis
500 mb heights & vorticity. THE & EDI - hard to conceptualize.	Two fields on each other. Banded surface features clean up.

13) Did you find the videotape a useful addition to the case study you examined in class?

	Squall Line Development	Cyclogenesis
YES	14	13
NO	0	0
COMMENT	2	3
NO ANSWER	1	1

14) Additional comments?

Squall Line Development	Cyclogenesis
Leave soundings on longer.	Tapes should be made available around department. Like banding, needs work.

APPENDIX C

DERIVED FIELDS FOR CASE STUDY ANALYSIS

I. Isentropic Cross Sections 00Z/12 MAY - 12Z/13 MAY

II. McIDAS Derived Fields

A. 1200 GMT 12 May

850 mb divergence

300 mb divergence

850 mb temperature advection

700 mb temperature advection

500 mb vorticity

500 mb vorticity advection

B 0000 GMT 13 May

850 mb divergence

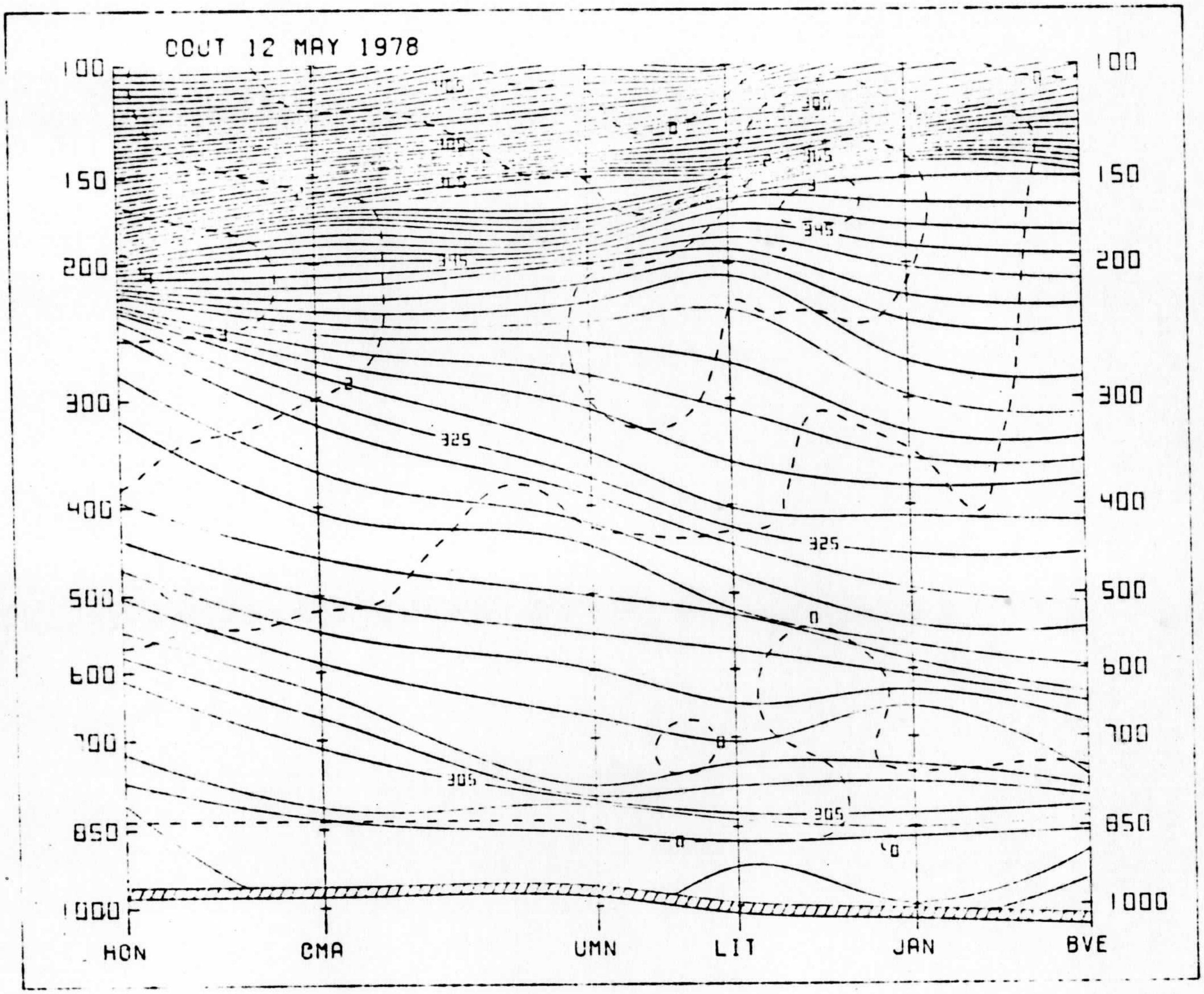
300 mb divergence

850 mb temperature advection

700 mb temperature advection

500 mb vorticity

500 mb vorticity advection



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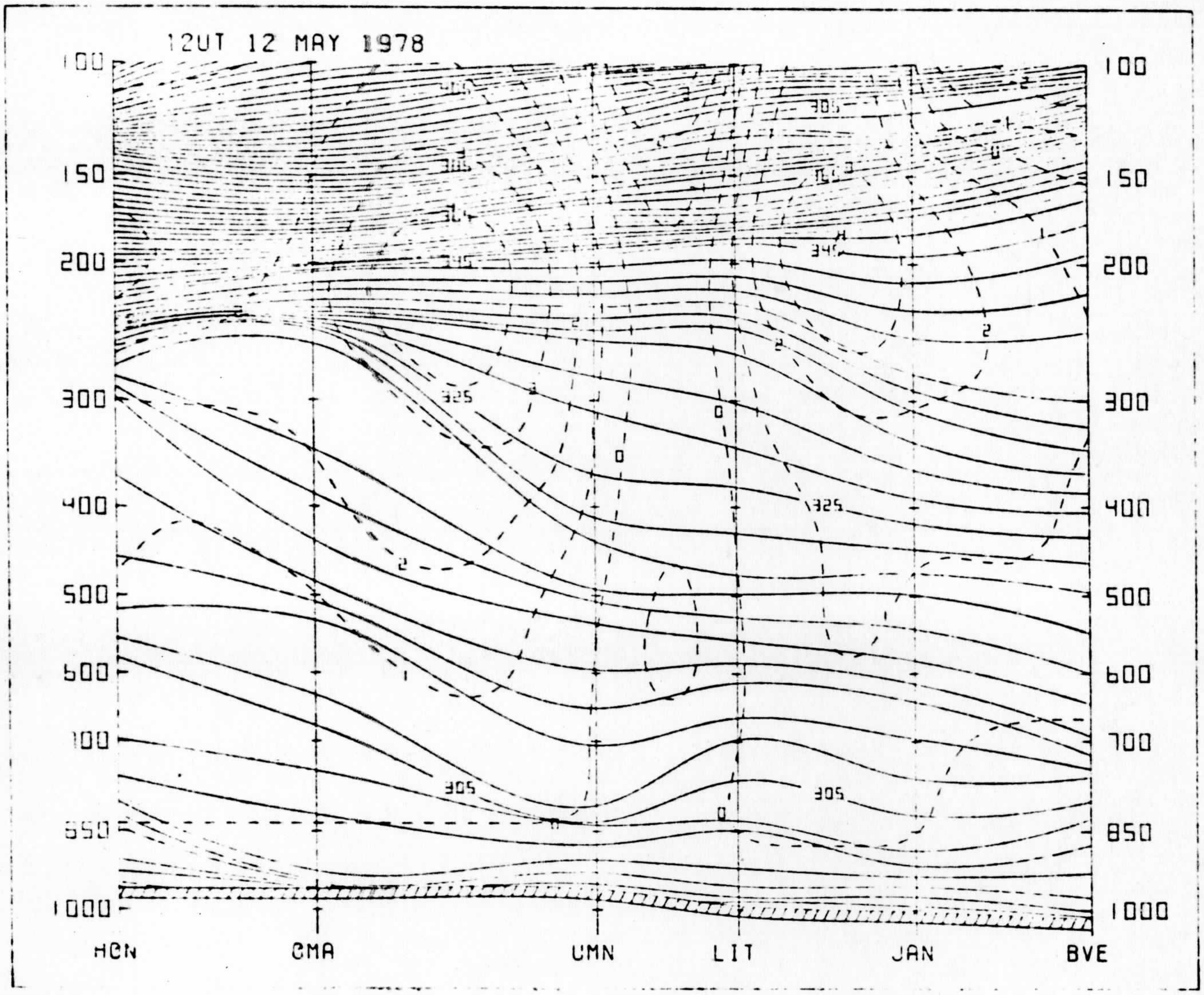

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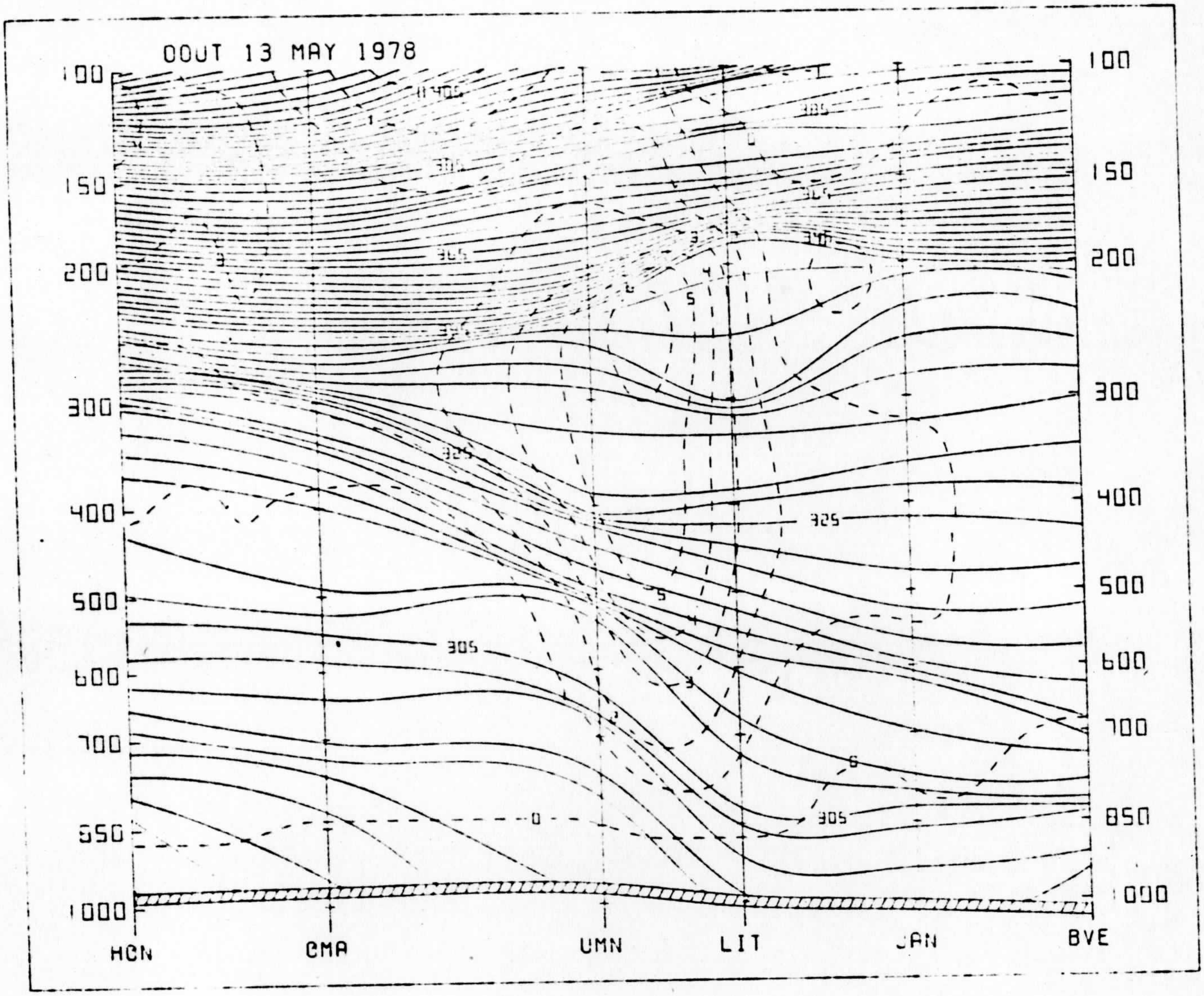

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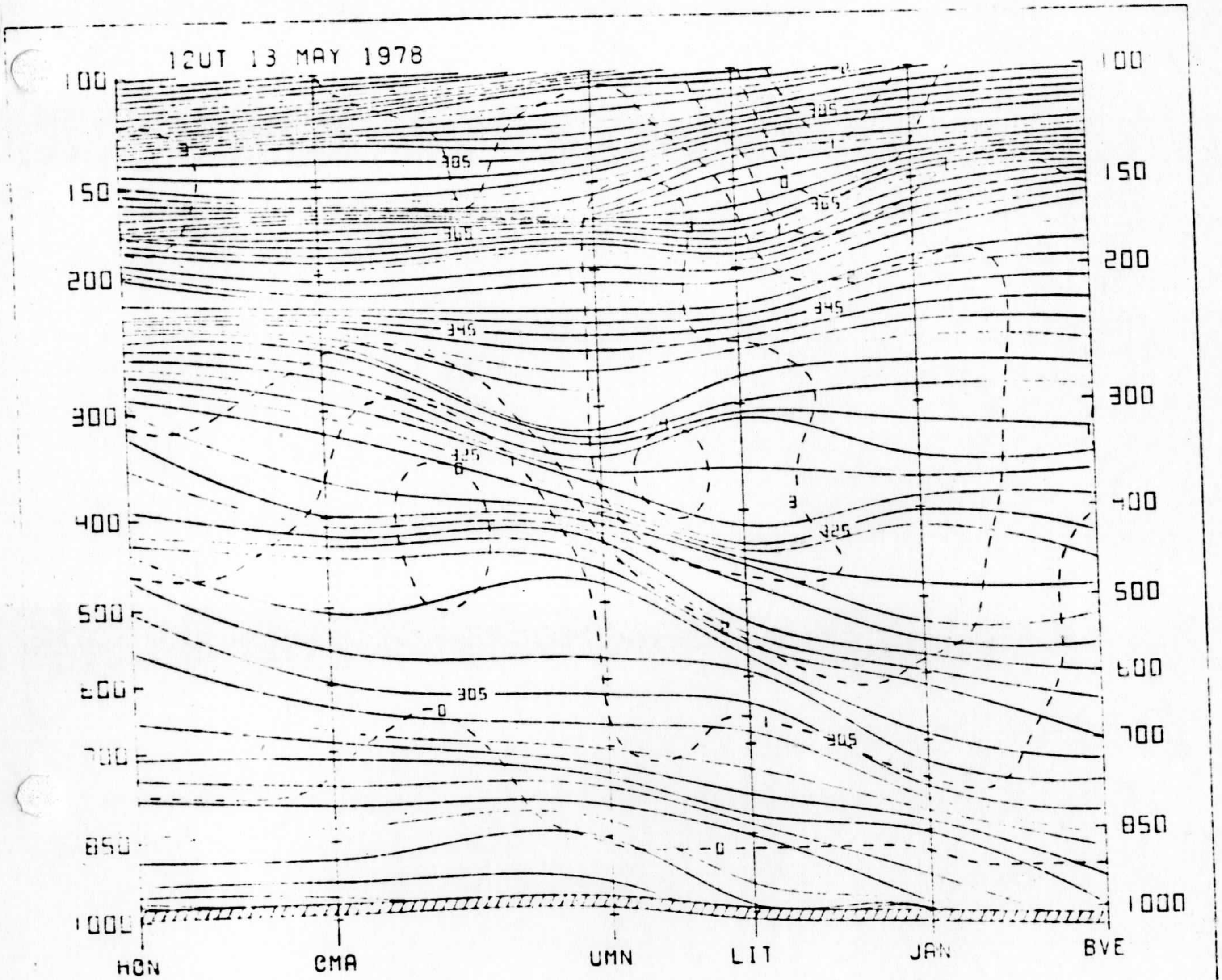
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-9	-11	-18	-24	-20	-15	-15	-13	-11	-11	-15	-18	-17	-15	-11	-6	-8	-11	-11	-12
-16	-18	-22	-24	-17	-11	-10	-11	-8	-3	-6	-16	-22	-18	-12	-9	-11	-14	-12	-8
-16	-16	-17	-15	-10	-5	-3	-4	-5	-5	-6	-12	-17	-14	-9	-8	-7	-8	-7	-4
-16	-13	-8	-3	-0	0	3	3	-2	-7	-9	-10	-11	-9	-8	-6	-1	2	1	-1
-10	-10	-8	-4	-3	-0	5	8	0	-11	-14	-14	-13	-10	-10	-10	-4	3	4	1
-5	-7	-10	-9	-4	1	7	9	2	-10	-17	-20	-20	-17	-13	-12	-6	-0	1	1
-4	-5	-6	-5	-1	2	5	7	4	-3	-10	-17	-22	-20	-14	-8	-3	0	0	1
-2	-2	-1	-0	0	1	2	4	3	0	-4	-10	-15	-13	-7	-4	-2	1	1	2
-1	-1	-0	1	2	2	2	4	3	2	-2	-7	-7	-2	2	0	-0	1	-0	-1

CONTOUR INT 5

-7	-4	4	12	15	12	7	2	1	-0	-5	-8	-7	-6	-5	-6	-6	-3	-0	1
-2	-4	-1	4	11	11	7	2	0	-4	-10	-11	-9	-7	-6	-5	-2	1	3	4
2	-0	-0	1	4	3	0	-1	-4	-10	-16	-16	-13	-11	-8	-0	6	8	7	6
8	5	4	3	0	-5	-8	-10	-14	-20	-23	-21	-19	-17	-5	9	16	14	11	10
15	9	9	10	2	-11	-17	-18	-24	-35	-37	-31	-27	-22	-2	16	19	17	16	15
13	11	13	22	16	-1	-14	-16	-21	-38	-51	-44	-34	-28	-10	6	12	19	23	22
-0	0	7	24	33	31	21	12	5	-16	-43	-53	-45	-31	-19	-9	0	13	22	21
-6	-12	-2	23	51	66	61	49	34	12	-19	-43	-45	-31	-19	-12	-4	1	6	7
-12	-19	-7	32	71	84	79	63	44	25	5	-19	-24	-15	-5	0	1	-4	-10	-8
-7	-14	-3	36	72	77	66	55	38	26	9	-5	-6	-2	4	11	17	9	-6	-12
-9	-14	-6	27	51	40	32	33	32	23	3	-11	-11	-7	3	15	28	26	9	0
-11	-14	-9	13	15	-2	-9	1	13	10	-3	-8	-6	-0	11	20	29	29	18	11
-13	-14	-12	-2	-5	-21	-26	-18	-9	-6	-5	3	11	25	30	29	31	29	22	18
-17	-19	-17	-11	-12	-17	-15	-10	-7	-6	-4	-1	8	28	39	35	33	28	20	16
-21	-26	-23	-13	-10	-12	-8	-1	2	3	1	-3	-8	7	24	26	25	21	15	12

-3 -4 -3 -0 0 0 0 -0

-2	-3	-4	-2	-0	-0	-0	-0	-0	-0	-0	0	0	0	0	0	0	0	0	0
-2	-2	-3	-3	-1	-1	-1	-1	-0	-0	-0	-0	0	0	0	0	0	0	0	0
-3	-3	-3	-3	-2	-1	-1	-1	-0	-0	-0	-0	-0	0	0	0	0	0	0	0
-4	-5	-5	-5	-4	-2	-1	-0	-0	-0	-0	-1	-0	-0	-0	0	0	0	0	0
-7	-8	-9	-8	-6	-2	-0	0	0	0	0	-0	-1	-1	-0	0	0	0	0	1
-9	-9	-11	-10	-6	-2	0	1	1	2	3	2	0	-0	0	1	2	2	2	2
-9	-10	-11	-9	-7	-4	-1	-0	1	4	7	7	4	2	1	2	4	5	3	2
-8	-9	-8	-7	-6	-5	-2	-0	1	4	7	8	5	2	1	3	6	8	5	2
-5	-5	-4	-3	-4	-3	-1	0	1	3	7	9	6	3	1	1	4	7	5	2
-3	-1	-0	-1	-1	-1	0	1	1	2	6	10	7	4	2	0	2	4	3	2
-3	-1	-0	-0	0	1	5	6	5	4	6	10	9	6	2	1	1	2	1	0
-5	-3	-2	-0	1	5	12	18	14	8	6	7	9	9	5	3	3	3	2	1
-3	-2	-2	-1	0	3	12	24	25	14	7	6	10	13	12	9	8	7	5	4
-1	-1	-2	-2	-1	0	6	24	31.	18	7	4	9	15	18	16	12	10	7	6

CONTOUR INT 2

-0	-0	-0	-0	-0	-1	-0	-0	[illegible]	[illegible]	[illegible]									
-0	-1	-1	-1	-1	-1	-1	-0	-0	0	-0	-0	-0	-0	-0	0	0	1	1	1
-1	-1	-2	-2	-2	-1	-0	0	0	0	0	-0	-0	-0	-0	0	0	1	1	0
-2	-2	-3	-4	-4	-2	-0	1	2	1	1	0	-0	-0	-0	0	0	0	0	0
-4	-5	-6	-9	-8	-3	0	2	3	3	2	0	-0	-0	-0	0	0	0	0	1
-9	-10	-12	-14	-11	-3	1	2	3	3	2	0	-0	-1	-0	-0	0	1	1	2
-13	-13	-14	-15	-11	-4	0	1	2	3	3	1	-0	-0	-0	0	1	2	2	3
-12	-14	-15	-13	-9	-5	-2	0	1	3	3	2	0	-0	0	1	3	3	2	2
-16	-18	-17	-10	-6	-4	-2	-0	1	3	3	1	0	0	1	3	7	7	4	2
-23	-23	-20	-11	-5	-1	0	1	2	3	4	3	1	1	1	3	7	9	6	3
-27	-28	-23	-13	-4	1	4	3	1	1	4	5	4	3	2	2	6	9	7	5
-33	-29	-20	-9	-1	3	6	5	2	1	2	5	5	5	3	2	5	8	7	6
-29	-19	-8	-2	0	4	6	6	4	3	2	3	5	5	3	2	3	6	6	6
-15	-6	-0	0	0	1	4	6	7	5	3	3	4	5	3	1	-0	1	2	3
-3	-0	0	0	0	0	2	6	8	5	2	2	4	6	5	2	-0	-1	-1	-0

CONTOUR INT 2

3	11	14	18	21	20	16	13	13	10	4	-0	-2	-3	-5	-5	-2	0	2	2
9	10	13	19	24	23	19	16	14	9	4	-0	-2	-5	-6	-4	0	2	3	3
12	12	15	21	24	22	18	16	14	10	5	1	-1	-3	-4	0	4	4	4	4
20	19	21	27	28	20	15	12	12	11	10	7	7	9	10	11	9	6	6	8
35	31	31	35	30	18	9	8	10	14	19	20	20	24	29	29	23	18	15	16
50	44	36	30	24	17	13	14	15	21	29	34	34	35	42	49	52	45	33	26
53	53	42	26	17	14	16	19	21	24	30	36	38	37	43	62	79	71	46	30
43	48	42	24	13	14	18	21	20	22	23	22	24	26	31	49	74	72	43	22
28	31	31	21	13	14	18	19	17	19	18	12	10	15	16	23	44	50	30	12
16	16	18	17	14	15	18	18	15	13	10	4	3	9	9	10	22	25	12	2
8	11	14	17	16	14	11	9	5	1	-1	-0	8	15	12	10	14	7	-4	-9
7	14	16	16	16	11	4	-3	-9	-11	-9	1	19	32	28	21	19	6	-9	-17
8	12	13	12	15	12	-0	-14	-20	-20	-8	9	36	60	60	44	30	15	-0	-7
7	9	8	9	13	8	-9	-24	-27	-20	-1	20	47	78	84	60	35	22	11	6

VOR 500 FROM 121200 CONTOUR INT 5

-1	-1	-2	-1	0	2	2	1	1	2	2	1	0	-0	-1	-1	-1	[illegible]	-0	-0
-0	-1	-2	-2	-0	1	1	1	1	2	3	2	1	0	-0	-0	-0	-0	-0	-0
-0	-1	-2	-2	-0	1	0	0	0	2	3	3	3	3	2	1	1	0	0	0
-0	-0	-2	-1	2	3	1	-0	-0	0	3	4	4	4	6	6	6	4	3	2
0	0	0	1	4	5	2	-0	-2	-2	0	3	3	2	3	8	12	12	9	5
4	6	7	6	5	3	1	-0	-3	-5	-5	-1	0	-2	-4	0	11	20	16	8
2	7	14	13	6	0	-1	-2	-3	-5	-6	-4	-2	-6	-15	-18	-2	19	21	9
-0	5	15	15	6	-1	-3	-1	-1	-1	-1	-0	-3	-8	-19	-31	-20	7	18	9
1	3	9	11	4	-2	-3	-0	1	2	5	3	-2	-6	-12	-26	-26	-5	8	4
2	1	2	3	1	-1	-0	2	4	5	6	2	-4	-4	-4	-12	-16	-8	-1	-3
-2	-3	-2	-0	2	4	5	7	7	5	-0	-8	-12	-3	4	1	-0	1	0	-4
-6	-5	-2	0	4	10	14	12	6	-1	-12	-24	-24	-4	14	16	14	15	12	7
-4	-3	-1	-1	3	15	21	16	3	-11	-25	-38	-39	-13	20	30	24	21	18	12
-1	-0	-0	-2	3	18	25	15	-1	-19	-34	-46	-50	-24	21	40	29	21	16	10

MAP 500 FROM 101800 CONTOUR INT 2

[illegible]	-11	-19	-32	-41	-39	-28	-20	-16	[illegible]	-8	-2	2	2	1	0	0	-0	1	-2
-3	-7	-13	-26	-40	-45	-37	-28	-21	-16	-9	-4	-0	-0	-0	1	1	-0	-1	-2
1	-2	-12	-28	-47	-50	-40	-30	-22	-14	-2	-2	-5	-4	-0	4	4	1	-0	-1
10	5	-7	-31	-47	-37	-21	-13	-12	-10	-4	-7	-12	-11	-1	6	5	1	-1	-2
14	11	3	-2	5	22	22	15	9	-2	-21	-30	-30	-21	-7	2	3	1	-3	-6
16	18	22	36	60	70	53	41	38	9	-36	-55	-50	-31	-16	-3	5	4	-2	-8
18	24	33	48	69	76	69	63	44	3	-43	-64	-53	-38	-27	-14	3	7	-0	-7
14	18	25	35	44	49	49	40	21	-7	-32	-44	-33	-24	-22	-15	-3	-1	-6	-8
2	3	6	9	15	19	20	15	1	-13	-25	-27	-12	-8	-9	-6	-3	-5	-10	-8
-2	-0	1	2	4	6	5	1	-5	-18	-29	-23	-12	-12	-6	1	-0	-8	-13	-10
-4	-3	-1	1	4	4	-0	-7	-17	-30	-36	-22	-15	-14	-4	3	1	-8	-13	-9
-6	-6	-5	-1	6	11	1	-17	-32	-38	-35	-17	-8	-4	-1	4	3	-5	-10	-9
-7	-6	-6	-3	7	18	7	-21	-36	-36	-30	-20	-12	-6	-0	3	3	-2	-8	-8
-5	-5	-6	-7	-2	15	16	-3	-18	-24	-24	-22	-23	-19	-12	-5	-1	-3	-6	-7

DIV 850 FROM 130000 CONTOUR INT 5

5	7	9	9	9	7	5	12	24	33	33	16	3	2	2	4	7	8	8	7
-1	-0	-1	-3	-2	0	5	18	27	32	33	25	11	5	4	5	6	7	6	5
2	-2	-12	-26	-34	-25	0	27	40	47	48	37	15	2	1	1	1	2	3	3
13	2	-19	-52	-67	-43	-1	29	47	66	69	47	13	-8	-11	-10	-7	-1	2	3
6	-2	-25	-58	-51	-7	25	32	36	59	65	40	9	-11	-22	-24	-15	-3	3	5
-16	-11	-20	-39	-21	12	24	21	29	50	48	28	10	-9	-27	-30	-16	-2	4	5
-15	-11	-23	-36	-20	1	12	21	37	48	41	29	19	0	-18	-18	-5	2	3	2
-4	-6	-22	-37	-30	-16	1	22	35	38	41	39	32	15	7	10	12	2	-7	-7
-3	-5	-21	-37	-40	-29	-0	28	35	37	33	30	26	17	19	30	29	8	-12	-16
-2	-0	-11	-30	-42	-30	-1	29	45	40	15	-13	-16	-1	15	32	30	6	-11	-12
-1	-3	-16	-35	-42	-31	-6	16	25	23	-6	-35	-38	-20	8	22	14	-4	-9	-5
-10	-18	-29	-35	-36	-25	-8	7	14	8	-7	-22	-39	-30	-8	5	0	-7	-5	-1
-17	-23	-28	-31	-32	-22	3	27	27	14	-1	-18	-35	-39	-21	-5	-0	-0	0	0
-25	-28	-29	-34	-41	-27	12	45	41	22	3	-13	-31	-41	-27	-7	4	6	3	1

DIV 300 FROM 130000 CONTOUR INT 5

1	1	1	0	0	-0	0	0	1	2	3	3	3	2	1	0	-0	-0	-0	-0
1	1	1	1	0	-0	-0	0	1	3	5	4	3	4	3	1	0	0	0	0
-0	0	2	3	2	2	1	0	-0	1	3	5	4	5	4	1	0	0	0	0
-2	-1	2	6	9	8	5	1	-1	-5	-5	0	4	6	4	2	1	1	1	1
-5	-5	-2	1	5	6	3	-0	-6	-15	-15	-3	5	6	4	3	2	2	1	1
-10	-11	-9	-4	-0	1	-0	-5	-15	-24	-21	-5	4	6	4	4	4	3	1	0
-16	-16	-11	-4	1	3	1	-4	-12	-18	-17	-8	-0	3	4	4	6	5	2	0
-16	-13	-7	-1	3	5	3	-3	-9	-13	-19	-13	-5	-0	2	4	6	7	3	1
-12	-9	-6	-3	1	3	0	-6	-11	-17	-26	-20	-9	-2	1	4	8	9	5	3
-7	-6	-5	-3	1	2	-1	-8	-14	-20	-28	-22	-11	-2	2	4	7	9	7	4
-5	-4	-4	-2	0	1	-0	-7	-15	-20	-21	-17	-9	0	4	4	4	5	5	4
-4	-4	-4	-3	-1	-0	-1	-5	-13	-14	-12	-9	-4	3	7	5	3	2	2	2
-4	-4	-5	-4	-4	-3	-2	-5	-12	-10	-6	-3	-1	6	11	9	5	2	2	1

TAD 850 FROM 130000 CONTOUR INT 2

-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	-0	0	-0	-0	-0	-0	-0	-0	-0
-0	-0	-0	-0	-0	-0	-0	-1	-1	-1	-1	-0	-0	-0	-1	-1	-0	-0	-0	0
-0	-0	-0	0	0	0	-0	-1	-1	-1	-1	-1	-1	-1	-1	-1	-0	-0	-0	-0
-1	-0	-0	-0	-0	-1	-1	-2	-2	-2	-1	-1	-1	-1	-1	-1	-0	-0	-0	-0
-3	-2	-2	-3	-4	-5	-4	-3	-3	-4	-3	-1	-0	-0	-0	-0	-0	-0	-0	0
-4	-4	-4	-6	-8	-7	-5	-3	-4	-6	-5	-1	1	2	1	0	-0	-1	-0	0
-2	-1	-1	-2	-5	-4	-2	-2	-4	-7	-6	-1	3	5	5	4	1	-0	0	1
3	7	10	8	5	4	3	0	-2	-4	-7	-4	1	6	8	9	6	2	2	2
11	17	22	20	13	8	4	-0	-1	-2	-12	-11	-2	2	6	7	5	2	2	3
14	22	24	14	0	-7	-11	-11	-7	-10	-26	-27	-12	0	4	4	2	1	1	1
12	13	3	-15	-28	-34	-31	-24	-16	-17	-34	-37	-21	-2	5	3	1	0	0	0
3	-3	-16	-26	-33	-37	-34	-24	-15	-16	-25	-32	-27	-11	2	3	1	0	0	0
-4	-10	-18	-23	-28	-32	-23	-11	-5	-6	-11	-19	-21	-11	0	3	2	1	0	0
-9	-13	-17	-22	-29	-28	-11	1	1	-1	-5	-12	-15	-6	4	6	3	1	0	0

TAD 700 FROM 130000 CONTOUR INT 2

11	14	18	20	20	16	11	9	10	10	10									
12	13	15	19	21	18	13	10	10	10	12	14	14	17	17	11	5	4	4	4
16	16	17	19	20	19	17	15	14	14	17	20	22	24	19	7	1	1	2	2
23	22	22	23	24	25	25	25	26	32	37	36	31	26	15	0	-1	1	3	4
30	27	27	32	37	41	39	36	39	55	66	56	40	26	5	-7	-6	0	5	8
32	30	30	36	43	49	48	45	50	72	88	73	46	21	-1	-15	-13	-4	4	9
31	35	40	43	43	41	40	38	50	76	97	89	54	19	-1	-11	-16	-10	0	7
30	39	51	57	52	42	35	37	48	69	105	103	62	23	6	-0	-9	-12	-5	2
30	38	51	62	61	53	50	51	55	76	130	137	78	31	12	6	-4	-17	-13	-3
27	33	44	56	64	70	76	80	72	86	141	149	90	37	15	7	-6	-22	-20	-9
19	23	26	33	47	73	94	99	88	86	114	122	84	39	14	4	-10	-23	-20	-12
12	10	6	4	19	56	89	101	91	80	74	74	61	36	14	0	-14	-23	-20	-14
4	-0	-6	-10	-0	28	60	82	77	54	33	20	21	15	5	-3	-12	-17	-15	-11
-1	-6	-12	-16	-17	-8	13	44	48	24	-0	-14	-13	-9	-6	-2	-4	-7	-7	-6

VOR 500 FROM 130000 CONTOUR INT 5
+CPUID:DAD DEV:22+ *** I D L E ***

[illegible]	0	0	0	0	1	1	0	-0	[illegible]	0	0	0	1	1	2	1	0	[illegible]	-0
-0	-0	-0	-0	0	0	0	0	-0	-0	0	0	1	1	3	3	1	-0	-0	-0
-2	-2	-2	-1	-0	-0	-0	-0	-0	-0	0	2	2	3	5	4	0	-1	-1	-0
-2	-2	-3	-4	-3	-3	-2	-2	-2	-2	1	6	7	8	8	3	-2	-3	-2	-0
0	-1	-4	-7	-6	-4	-2	-3	-7	-7	0	12	15	15	12	2	-6	-8	-5	-2
1	-2	-8	-9	-5	-0	1	-2	-12	-15	-1	19	27	23	16	4	-7	-13	-11	-6
-3	-10	-14	-10	-1	4	4	-5	-19	-25	-8	24	39	32	20	10	-0	-11	-13	-9
-7	-16	-18	-9	1	4	-2	-14	-27	-41	-22	27	51	40	22	15	8	-4	-13	-11
-5	-14	-16	-7	-1	-7	-18	-23	-35	-47	-42	31	55	51	24	16	14	2	-12	-13
0	-5	-5	-3	-11	-27	-31	-20	-12	-35	-36	17	52	47	28	17	17	6	-10	-13
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21	28	26	4	-33	-47	-57	-15	38	55	29	-4	-11	-0	8	12	12	5	-2	-3
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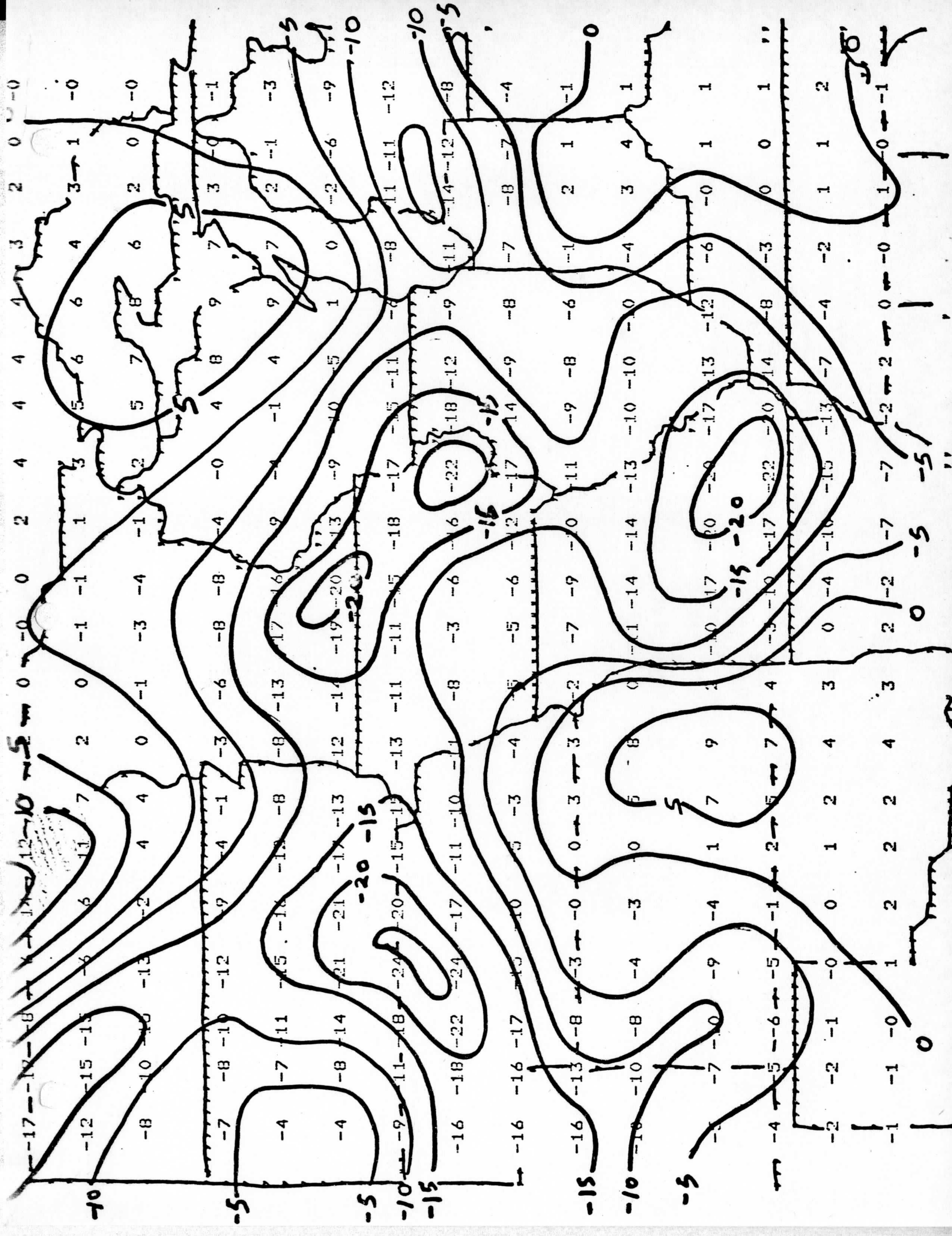

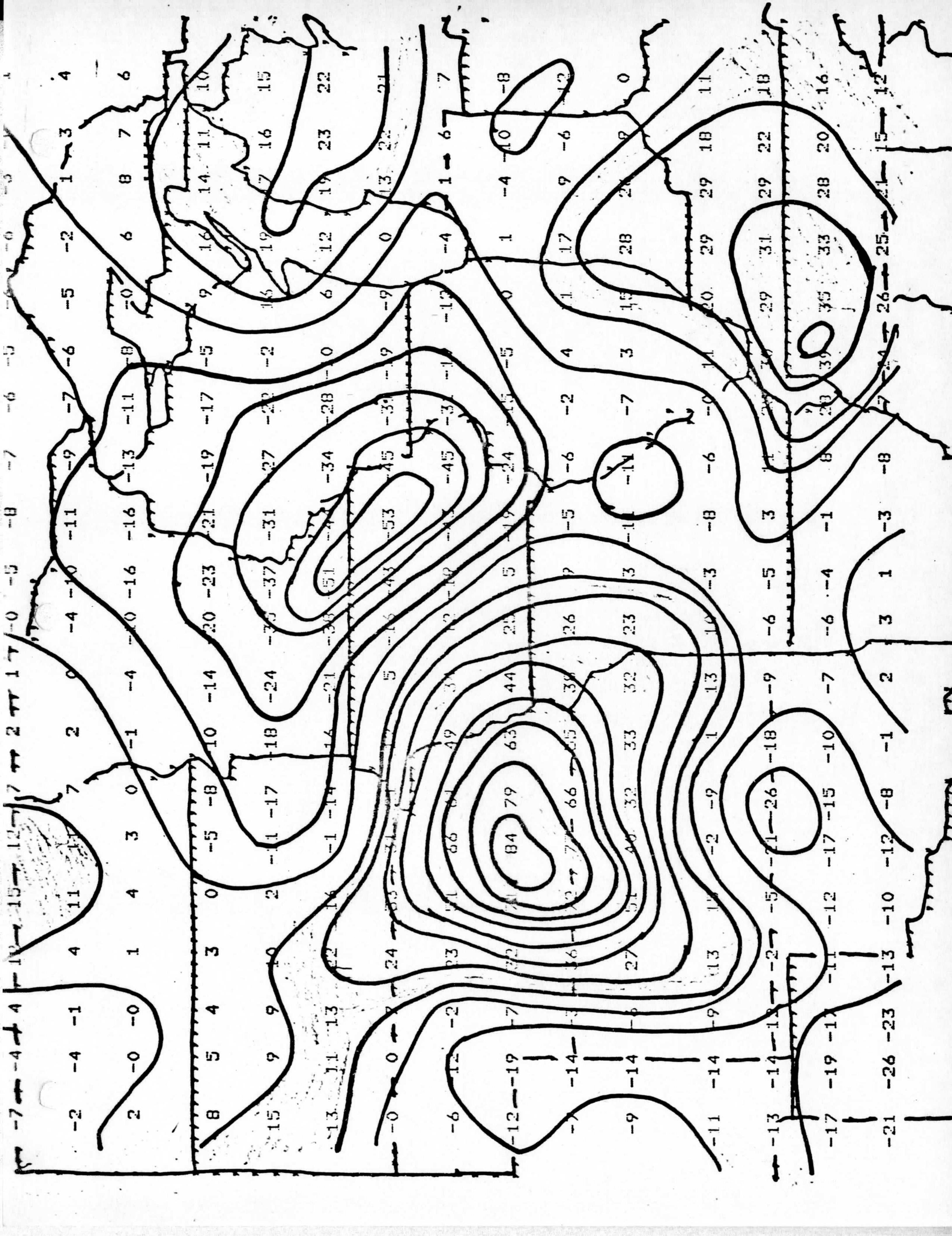

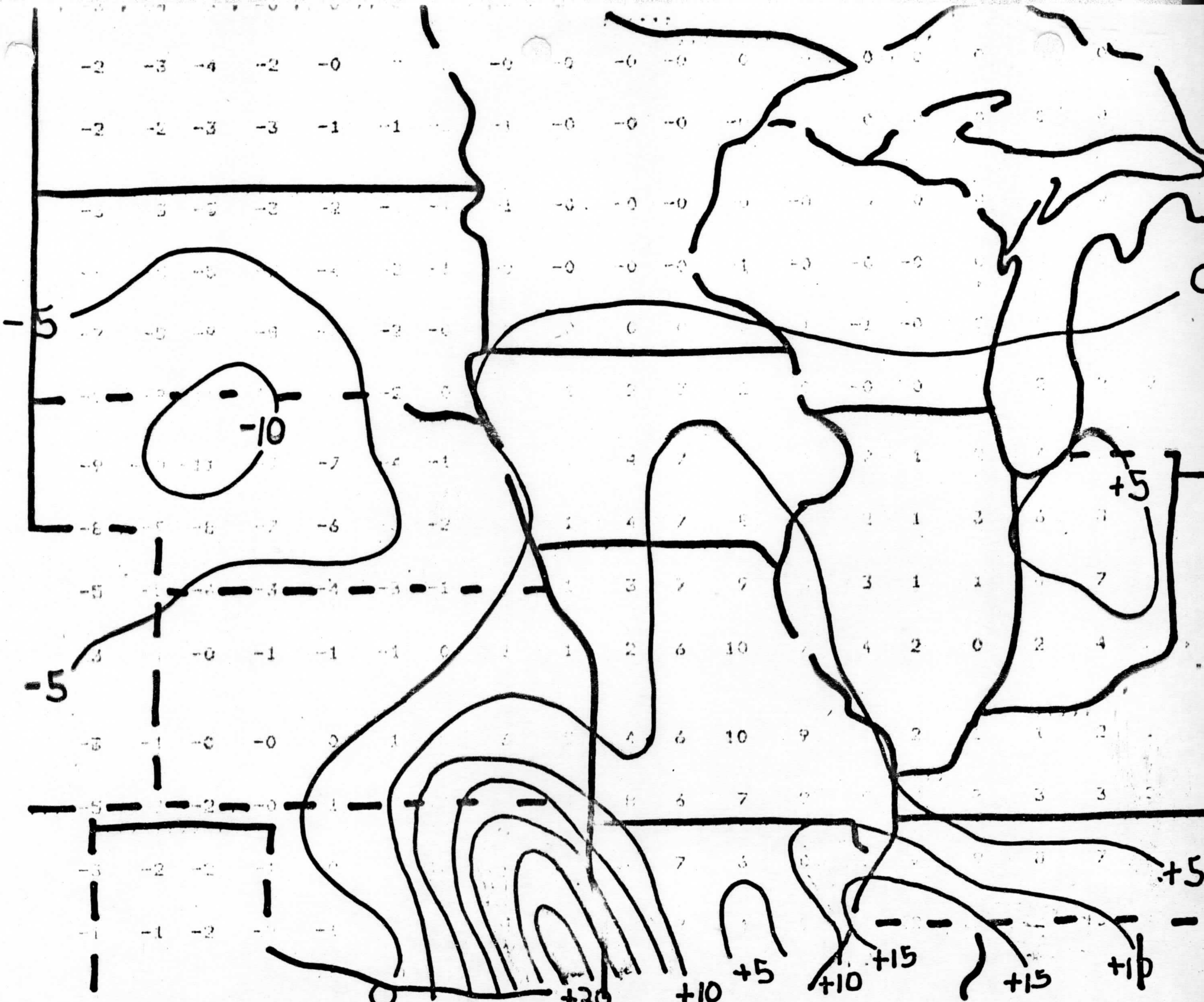

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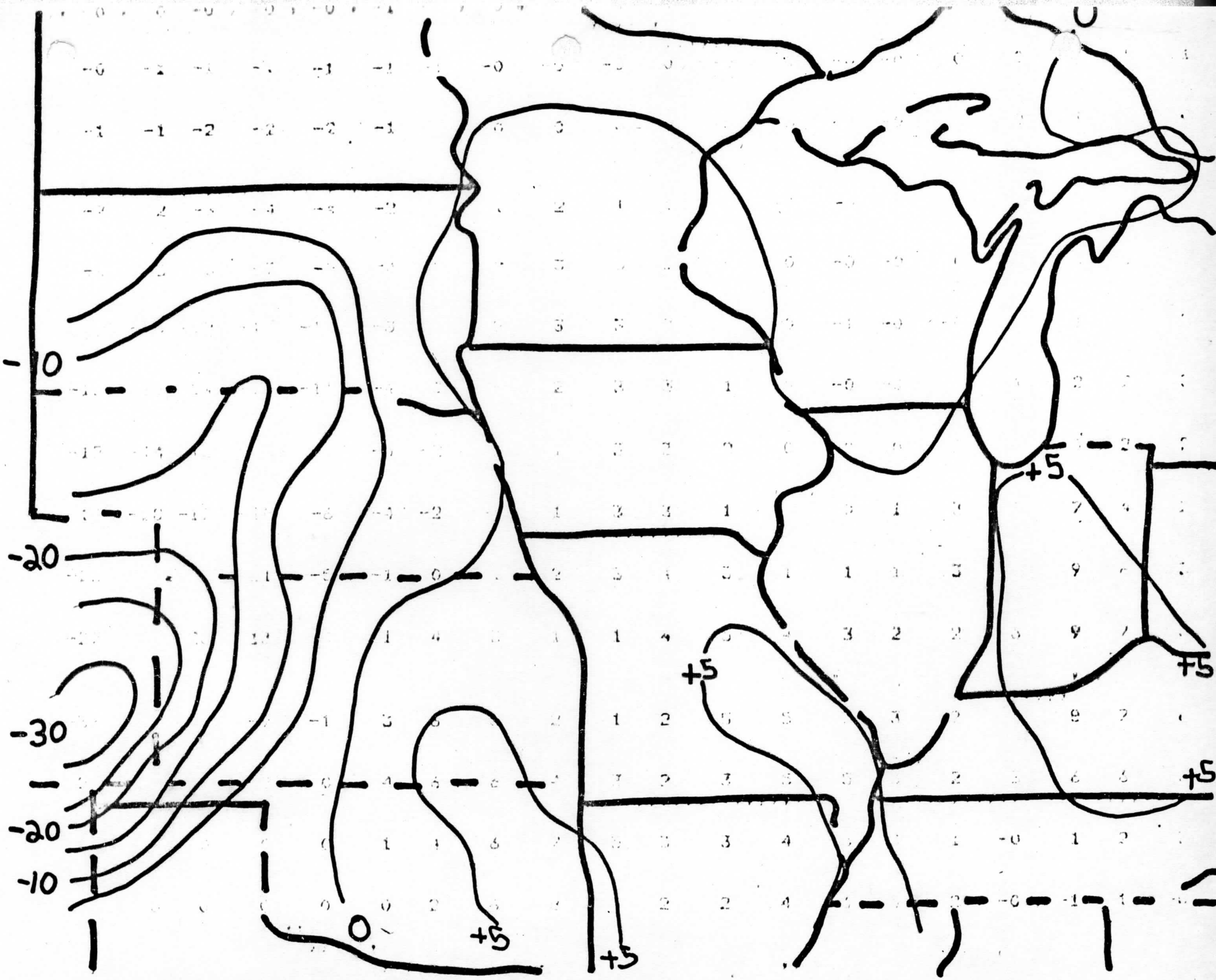

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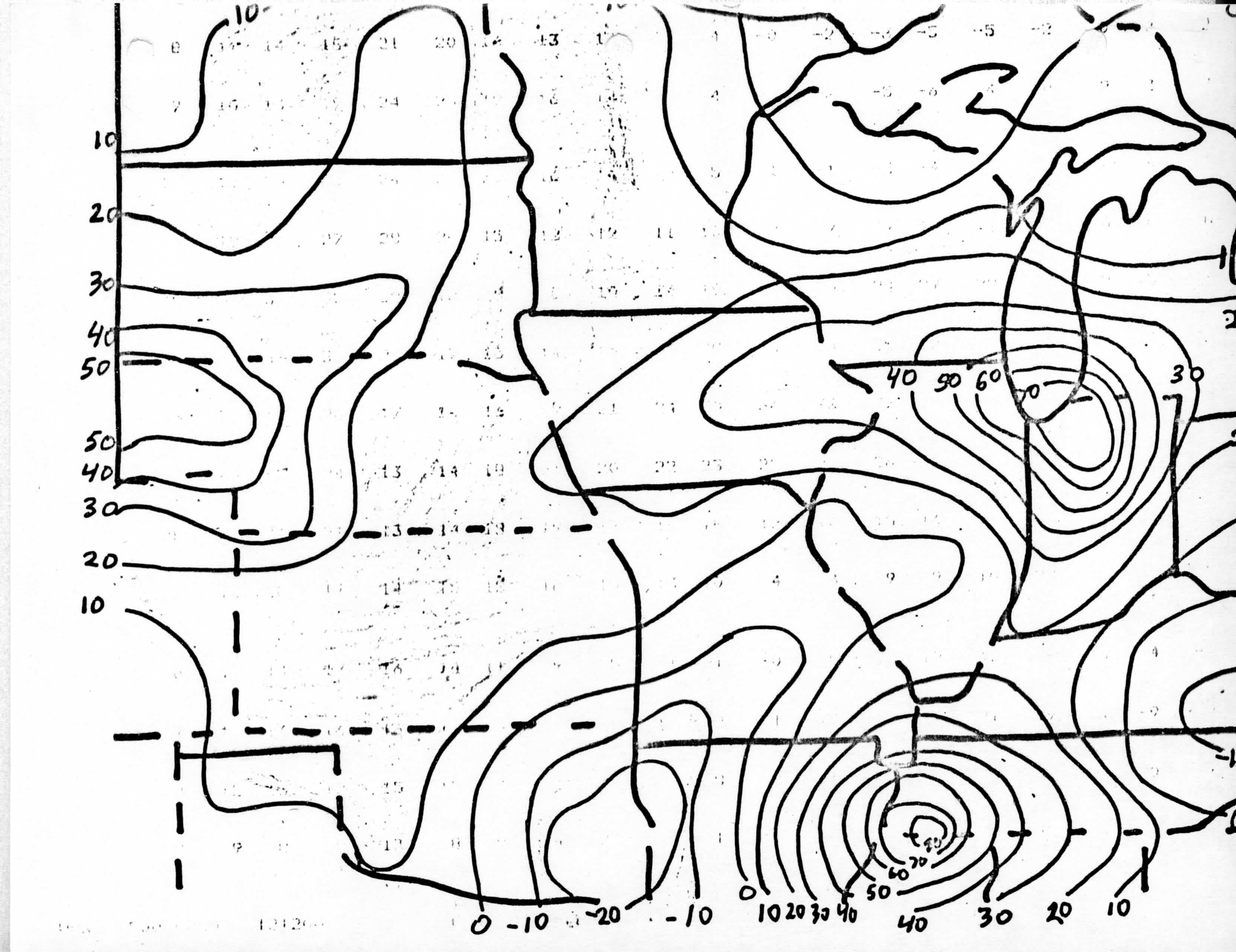
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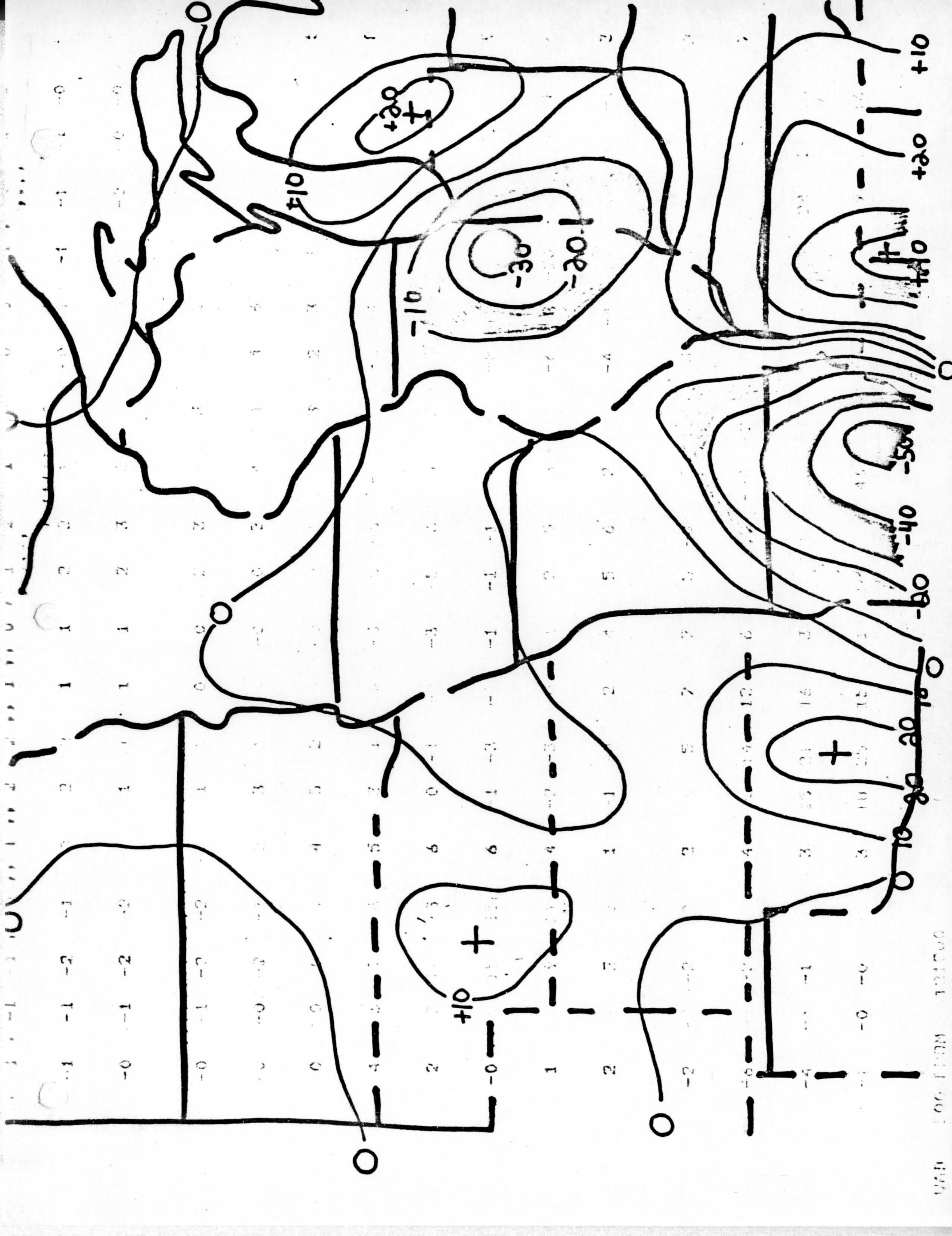

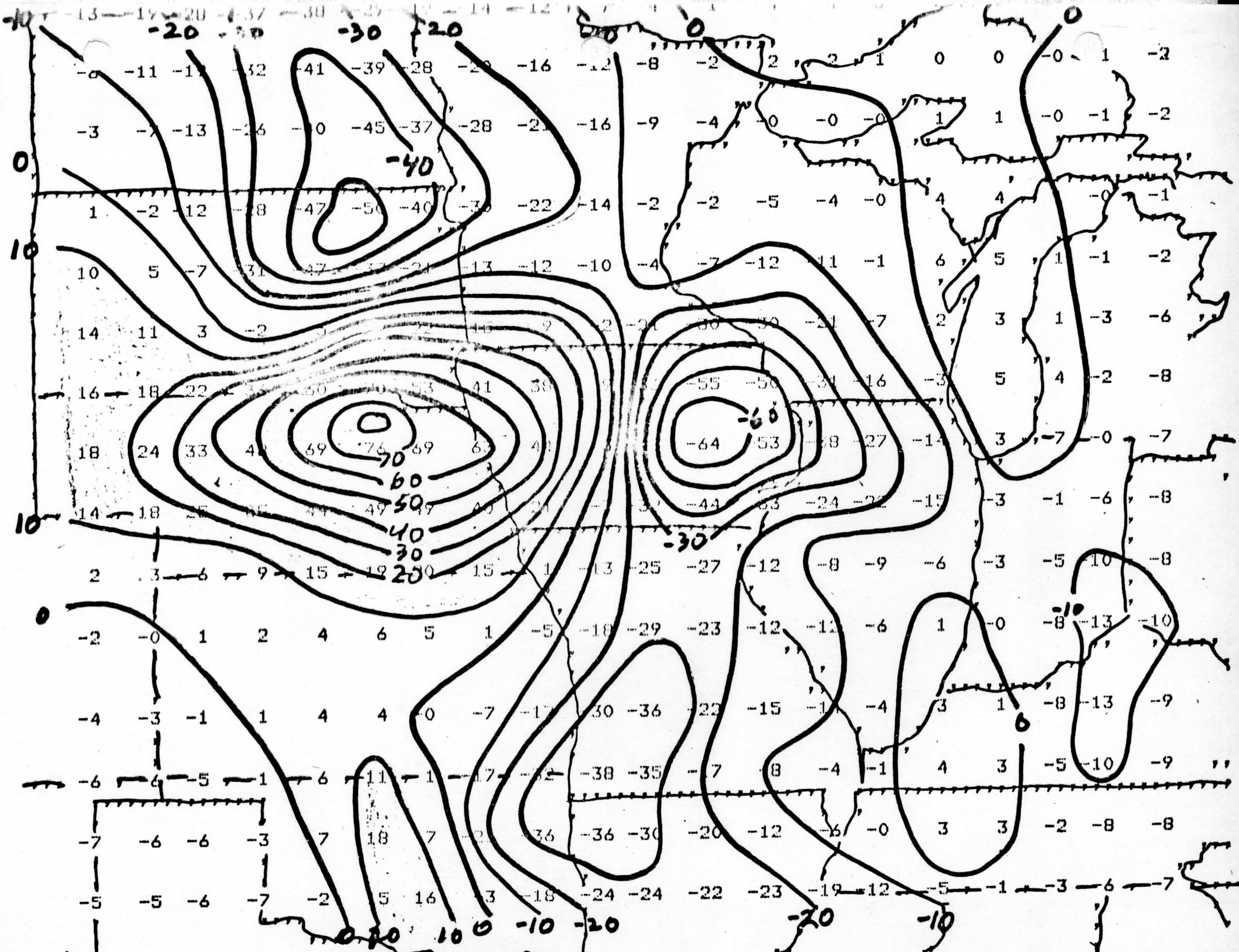

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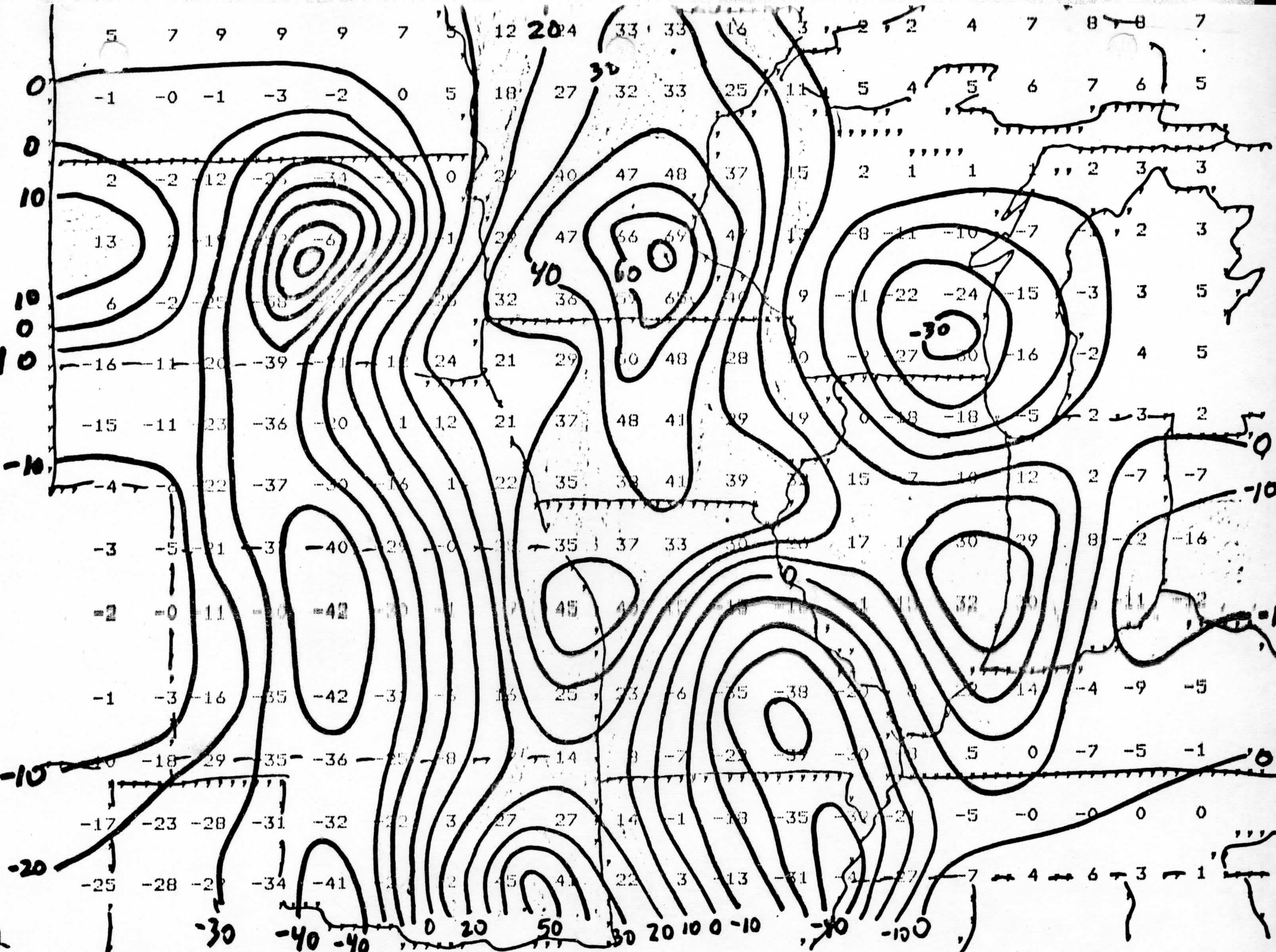

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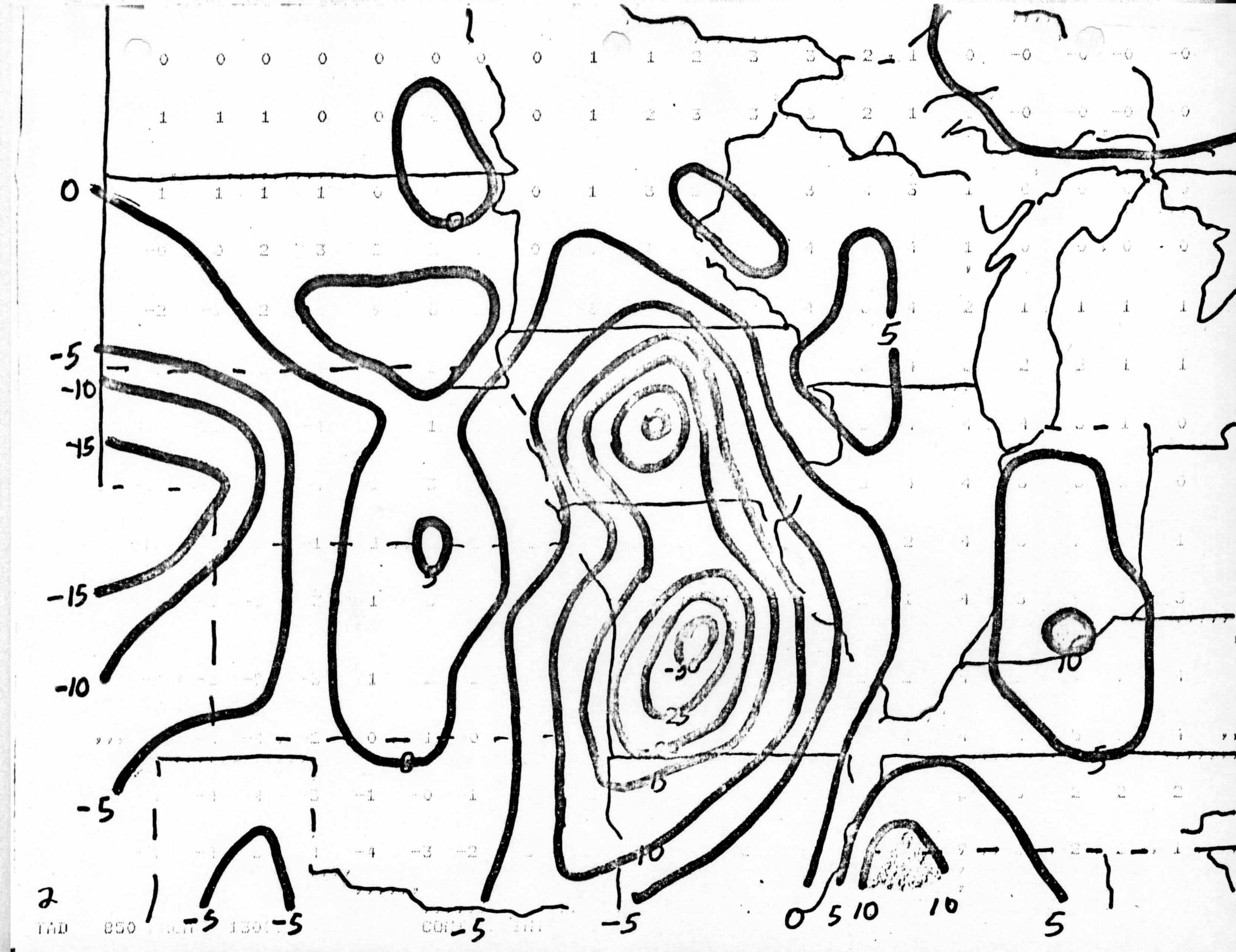

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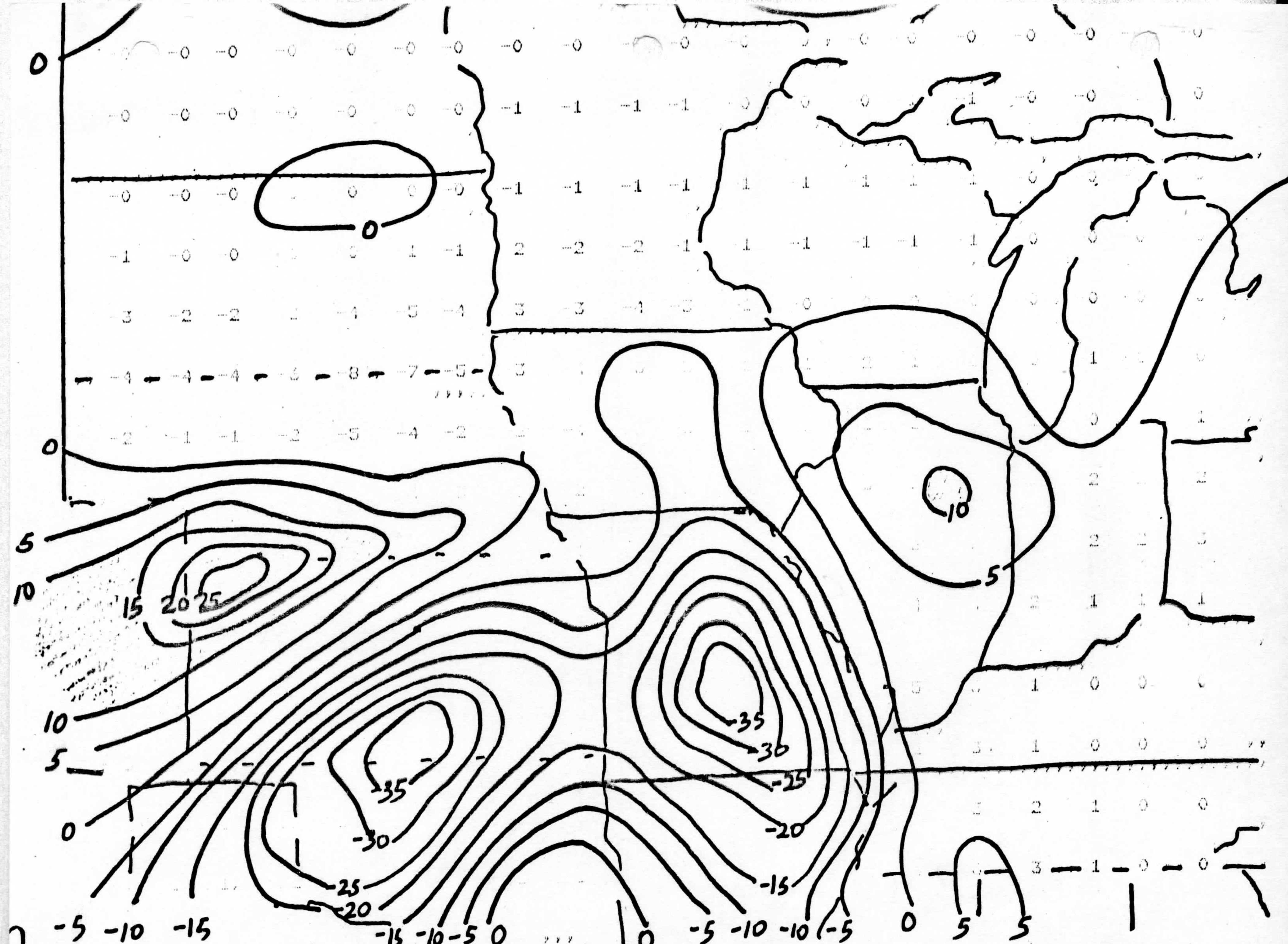

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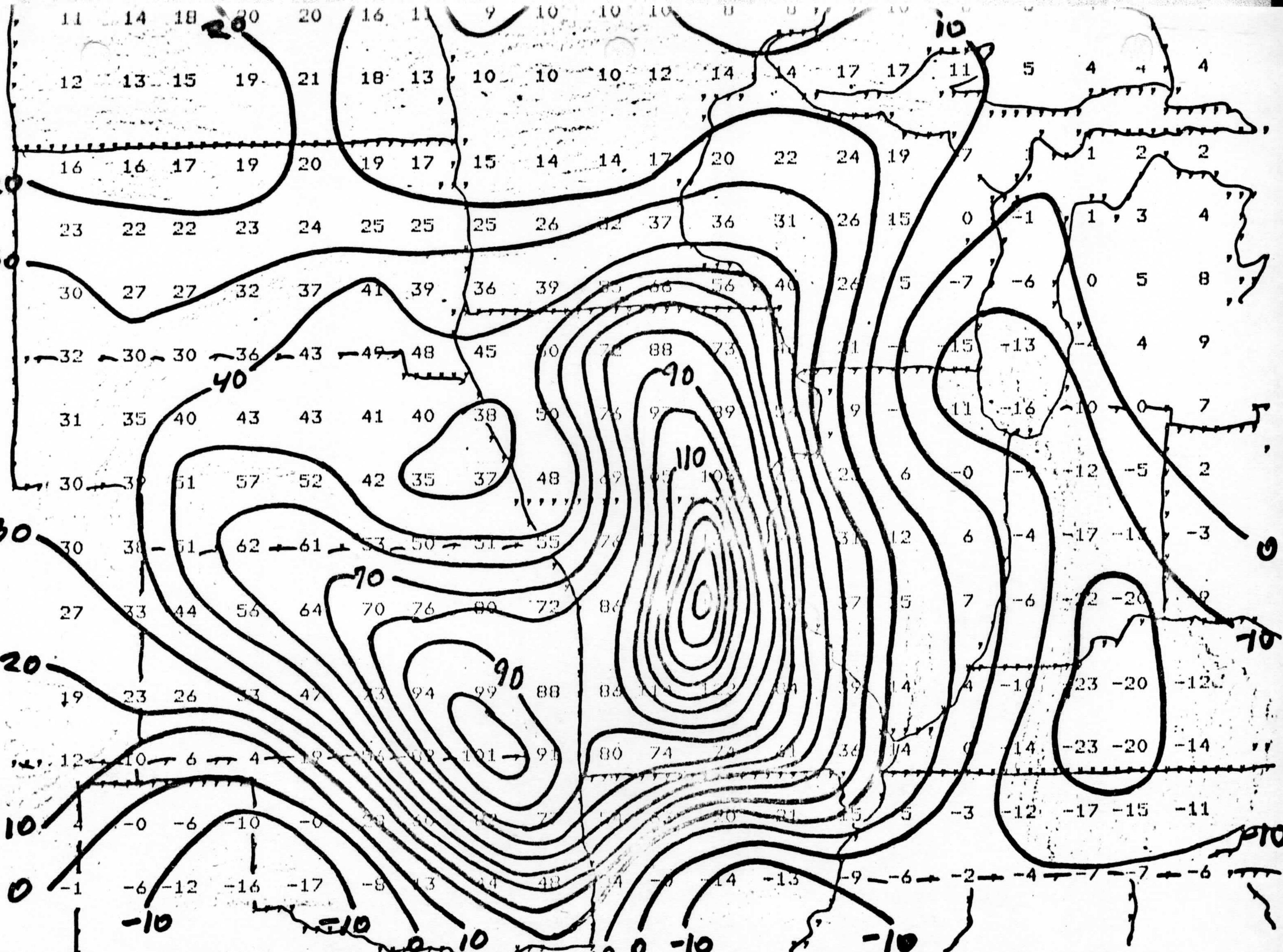

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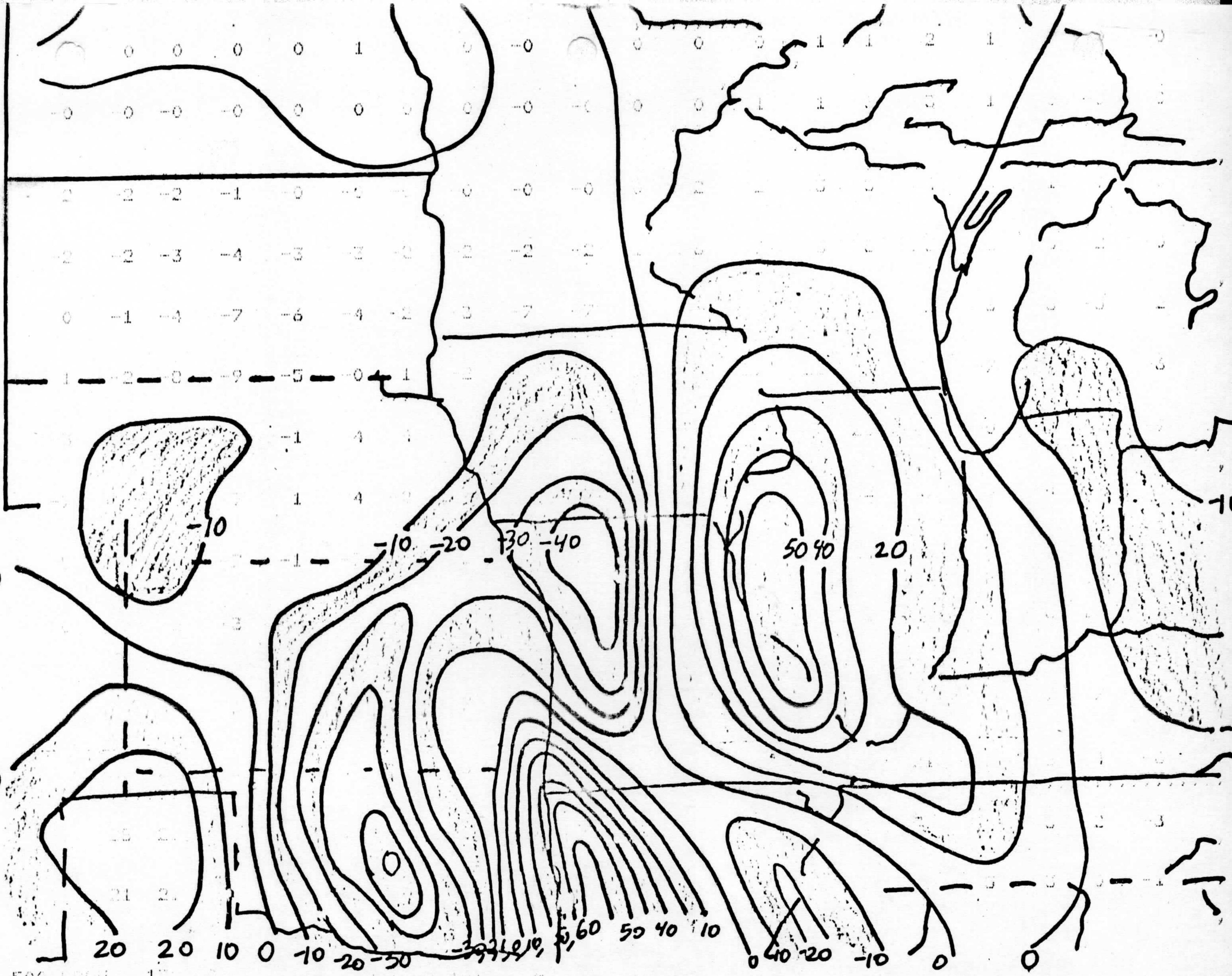

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APPENDIX D

DISCUSSION AND ASSESSMENT OF THE McIDAS DERIVED FIELDS FOR THE MAY 12-13 CASE

APPENDIX E

INDIVIDUAL STUDENT PROJECTS USING McIDAS

1) ENHANCED MACRO-SCALE SQUALL-LINE ANALYSIS — MARTIN HOERLING

2) INTENSITY ANALYSIS OF HURRICANES DAVID AND FREDERIC USING ENHANCED INFRARED SATELLITE DATA — KEITH BLACKWELL

3) HEIGHT ADVECTION ANALYSIS OF THE ~~8~~ MAY 1978 STORM USED ~~AFTER~~ CASE STUDY — JOHN STUWE

4) ANALYSIS OF ADDITIONAL ISENTROPIC CHARTS FROM MAY 1978 CASE STUDY — TODD SCHAACK

5) VERIFICATION OF STABILITY INDICES FROM MAY 1978 CASE STUDY — PATRICK LAYBE

6) MESO-SCALE ANALYSIS OF THE 12 MAY, 1978 STORM — PATRICK THORSON

7) ANALYSIS OF STABILITY INDICES FROM MAY 1978 STORM — RUSS SCHNEIDER